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DOCUMENTS SECTION

SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA:
1874.

REPORT OF PROGRESS
IN
THE DISTRICT
OF
YORK AND ADAMS COUNTIES;
ILLUSTRATED BY
MAPS AND CROSS-SECTIONS,
SHOWING
THE IRON ORE BELTS AND INDIVIDUAL MINES;
WITH DESCRIPTIONS OF THE SAME,
NOTES OF A TRANSIT LINE TO ESTABLISH ALTITUDES, AND A
CATALOGUE OF SPECIMENS COLLECTED AND PLACED
IN THE MUSEUM AT HARRISBURG.

BY

PERSIFOR FRAZER, JR.

HARRISBURG:
PUBLISHED BY THE BOARD OF COMMISSIONERS
FOR THE SECOND GEOLOGICAL SURVEY.
1876.

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254672

225 South Sixth St., Philadelphia,
January, 1875.

Professor J. P. Lesley,
State Geologist:

Sir:—In preparing to carry out your instructions to study the ores along the line of the Codorus, I placed my aid, Mr. Ambrose E. Lehman, on active field duty on July 13. I myself was not able to go into the field till July 20, on which date the third member of my regular party, Mr. Allen, also joined me.

Mr. J. W. Edwards joined me a few days later as volunteer aid, and remained with me till his assignment to other duties by the Chief Geologist.

My head quarters were established at York, York county Pa., whence it was my plan to project a net work of intersecting lines north-eastward to the Susquehanna, and south-westward to the Maryland line below Littlestown, in Adams county. My work was very much hampered at first by the lack of suitable surveying instruments, and this embarrasment was the greater because the first lines run were necessarily of greatest importance. All the work represented by road lines on general map (No. 1) was accomplished by the aid of a small Breithaupt compass, and the distances obtained by pacing, except the test circuit line which, starting from York, proceeds four miles north north-east to Smyser's bank, thence south south-east to Longstown; thence south south-west to Logansville; thence west south-west to Zigler's slate quarries; thence west south-west to Jefferson; thence west south-west two and a half miles to fork of road near Metzel's mill; thence four miles south to Hofacker's. Resuming the line at Metzel's mills, four and a half miles west to Hanover; thence seven miles west south-west to Littlestown; thence four miles west south-west to the Maryland line, (Mason and Dixon's,) and five and a half miles east along the same. This line, as well as all the section lines, were run with telemeter rod and stadia very carefully; irregularities of the needle being guarded against by several readings, the limit of distance of single sights exceeding 300 feet only in very rare cases.

Until the arrival of the transit every station was made a barometer station, except those south-west of Mudtown, (which is two miles south-west of Hanover,) at which point the instrument, in my possession, sustained an injury, which rendered it useless.

The 10 foot contours were sketched in during the entire progress of the field work.

After the arrival of the field transit, a vertical angle was read for every station, so that no point on the map is without its hypsometrical datum.

The first step was to secure plans and profiles of the railroads which run through or near the field of operations, and for this purpose Mr. Lehman visited Hanover and York before the party came together, and through the kindness of Capt. Eichelberger, President of the Hanover Junction and Hanover and Gettysburg railroads, and Mr. Jos. Gitt, Chief Engineer of the York and Hanover Short Line railroad, alignment tracings of these roads were obtained. Later, Mr. J. N. Du Barry, Chief Engineer, and now Vice President, of the Northern Central railroad, and Mr. W. E. Weber, of the Northern Central railroad, extended valuable aid to the party, and assisted us very much by the loan of the plans, profiles, &c., of this road.

The hope of getting the same data of the Wrightsville Branch of the Pennsylvania railroad was disappointed, as no notes of this road could be found. It is accordingly laid in from the York County Map, published by Shearer & Lake, Philadelphia, 1860, and checked by its intersections with the transit lines. It seems but proper to acknowledge in this place the courtesy and kindness of the officers of the various railway companies, and pre-eminently those of the Pennsylvania and Northern Central lines. This kindness was not merely the result of the obedience of the subordinates to the general order issued from the central office, requesting that every employee might render to the Survey what assistance he could consistently with his duty, but appeared rather the spontaneous offering of the individuals themselves, who took pride in their native State and were glad to further any enterprise whose object it was to illustrate her resources to the world.

After the preliminary adjustment of instruments, lines were started up the Codorus to the junction of the West and South branches and further up the South Branch. Simultaneously with this work, lines were run on the Carlisle and Gettysburg roads to the edge of the Mesozoic red sandstone formation, the object being to cover a belt of country including the two ore ranges which are the subjects of the special map. It was not thought at that time that more than this could be accomplished during the first season, nor was it known at that time how extensive these two ranges are.*

It was designed to cross-bar the map with dip angle stations, by means of which it was hoped that the positions of the magnetic ranges, if any, could be more clearly made out. Quite a large number of observations had already been made, before it was found that the dip needle, in use, was entirely unreliable, and this, which was to have been an interesting feature of the survey, was reluctantly, for the time, abandoned.

Mr. Hilgard's party, sent by the United States Coast Survey to determine the magnetic variation at York, completed its labors shortly after the arrival of the party in the York district.

The mean variation as determined last summer, and kindly supplied to the Pennsylvania Geological Survey by assistant J. E. Hilgard, U. S. C. S. Office at Washington, is an invaluable check on our compass lines, the general accuracy of which it establishes.

The normal dip angle was also obtained, but cannot be made use of for the reasons set forth above.

The thanks of the party are due to the many persons residing in York county, who furthered the work of the survey by their welcome assistance. Among these must be especially mentioned Mr. Henry Hantz, of York, whose intimate knowledge of the country, and of the several ore enterprises which have been prosecuted there, and whose kindness in acting as guide on very many occasions, saved the party much time and expense.

In order to facilitate the collection of statistics regarding the various banks, a series of questions was printed and furnished to the members of the party, to be left at the bank, or forwarded to the proper person, in case the needed information could not be secured at the time of the visit of the party.

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*The Maps were constructed during the winter months of 1874-'75, and held in hand for revision until the report was called for by the State Printer in September, 1875. This delay, rendered necessary by the publication of five other reports of the progress of the survey in other parts of the State, was of use in revising certain parts.

In conclusion I would mention, with commendation, the industry and intelligence displayed by Mr. Lehman in the field, and his excellent reduction of the work to map form; the general efficiency of Capt. Allen, and the willingness and zeal of Mr Edwards.

Very respectfully,
PERSIFOR FRAZER, JR.

REPORT OF PROGRESS

IN

YORK AND ADAMS COUNTIES,

1874–'75.

BY PERSIFOR FRAZER, JR., ASSISTANT GEOLOGIST.

ERRATA.

Page headings pp. 2 to 80: for 1874–'75 read *1874.*
Appendix to special map: for New Fredom read *Freedom.*

accompanying this report, the relative positions of the ore banks and openings are designated by numbers, from 1 to 126, corresponding to the numbers in this catalogue. And on the margin of the map the numbers are placed in a column opposite the names of the owners or lessees.

The order of the numbers proceeds from north-east to south-west, in belts across the map; the first belt being near the Maryland line, and the last belt near the South Mountain, thus:—

Nos. 126 to 122, on the north, near Dillsburg.
No. 121, further south, west of Wellsville.
Nos. 120, 119, further south, south of Wellsville.
No. 110, near the Susquehanna above Wrightsville.
Nos. 118 to 111, in a group north of York.
Nos. 109 to 67, from a point in Adams county, north of Hanover, to Wrightsville, through York.

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[*] To these must be added the nine banks marked in the catalogue 54 *a* to 54 *i*; and such other exhibitions of ore as are noted in the catalogue, but not numbered on the map.

Nos. 66 to 15, from Littlestown, in Adams county, through Hanover, Jefferson, Hanover Junction, Margaretta furnace, to the Susquehanna river, south of Wrightsville. (Nos. 54*a* to 54*i*, have been added since the printing of the map for this edition, but will be found on the large special map.)

Nos. 14 to 7, south of Margaretta furnace; from south of Jefferson and Logansville to Red Lion.

Nos. 6 to 1, from the south line of York county, or the Maryland State line,* to Shrewsbury.

The catalogue will be continued as the work of the survey advances, and another map will be prepared, covering that area of Adams county not included in the present map.

The ore banks of the Central Brown Hematite belt or range are again given on the large special map prepared for that purpose and published with this report.

The geology of York and Adams counties, explained in subsequent chapters of this report, can be understood by reference to these two maps.

The catalogue of ore banks and openings, in this chapter, is intended merely to supply such information as the following, namely: The geographical location of each mine; the name of its owner, owners or lessees; the general character of its ore, without special reference to its geology; its relative magnitude and importance; and such statistics of labor or market as may have been taken at the time of visiting the bank.

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* As the general strike of the measures is from east north-east to west south-west, and the preponderance of the dip north north-west, it is evident that the older series must lie to the south-east and the later to the north-west. Commencing the cataloguing of the banks on the oldest measures from the north, No. 1, will be the north-easternmost bank on that belt, whose strike if prolonged to an imaginary east and west line, would intersect that line at a point farthest to the east. No. 2, will be the next following the west south-west strike. Of course in some cases banks occur near each other, and not exactly on the same strike which are included together as one formation, and it becomes a matter of judgment alone to decide how far apart such banks may lie without belonging to different terranes or ranges. An example is seen in numbering the banks in the vicinity of Margaretta furnace, and also those north of York, where banks seemingly (and perhaps actually) belonging to the same terrane, have been numbered as if in different ranges. This is a matter of comparatively trifling importance, and the numbers are used simply in lieu of abbreviated names to distinguish the banks from each other, and yet designate them on a map of the small size as that which illustrates this part of the report.

No special effort has been made to get materials for a thorough statistical and economical iron ore report, because the energies of the party were necessarily devoted to a study of the geology, which is of a difficult character in this disturbed district. Many facts, however, relative to the industry as well as the geology of the district are placed here on record for present or future use, and references are in all cases made to the original entries in the Field Note Books of the Survey.*

The reader will understand that by no means all that can be said about the mines will be found recorded in this catalogue, but only such notes taken on the spot, as have not been used in the following chapters to explain the geology of the iron ore district.† In those chapters he will find references to the mines named‡ and numbered in this catalogue.

Specimens of ores and rocks were selected from all the mines and openings, and are placed in the State Museum of the Survey at Harrisburg, for inspection, numbered and labelled with

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*Thus:—No. 1, *Young's opening*, &c., &c., (II, 28) meaning Field Note Book, York and Adams, Volume No. II, page 28.

† The reason for preserving and publishing such notes is evident, since many details of apparently slight value at the moment, often assume great importance in seeking the solution of practical and even theoretical questions, long after they have ceased to represent the actual state of things at the workings in subsequent years. The kind of transportation employed to take ore out of the cut and to get it to the shipping station, may tell a practical miner more than pages of description of how the ore occurs and what are its prospects for continuance.

In such cases the statements of interested parties or a report based on the usual hasty visit of an expert to the locality, may convey a wrong impression, but the business principles of successful companies and individuals will lead to actions in these minor matters which may be interpreted as the legitimate result of all that those with the best facilities, the largest experience, and the strongest reasons for ascertaining the truth, know of their own mines.

The cost of labor anywhere and for any purpose is interesting and important. It is a fundamental factor in every problem of society, and a most sensitive barometer of the condition of the country. In adding such statements of wages as appear in the following pages, the party has simply furnished a few floating data to the statistician, just as the transient surveying parties of the west do to the meteorologist.

‡The names of banks are in many cases not those by which their owners and the residents of York county know them. It is seldom that two persons can be found who call a bank by the same name. But any inconvenience from this cause will be obviated by the statement of the direction and distance of each from some known point.

the locality from which each came. But these could not correspond with those subsequently given to the mines, because the order of their collection was different, and because specimens of rocks from localities between and distant from the mines were also collected for study and exhibition. But the method of numbering the ore banks and openings is essentially the same as that adopted for numbering the specimens in the State Cabinet, for the geological reasons given in the foot note to page 2 above.

In the following alphabetical list of ore banks are given the *label numbers* of the specimens collected at each ore bank, with its *map number* in this catalogue.

Alphabetical List

of the Ore Banks and properties on which ore was observed in York and Adams counties, indicated on the maps accompanying this Report, with the label numbers of the specimen ores in the Harrisburg Cabinet.

Name of the mine.	Label Nos.	Map No.
Ashland Iron Company,	(255)	97
Ashland Iron Company,	(253, 254)	104
Barcroft, (or Butcher,)	(74, 75)	24
Barley,	(76)	25
Bauman, J.,	(260, 261, 262, 263)	55
Bauman,	(—)	105
Bechtel,	(250)	101
Bechtel, George,	(—)	93
Benade, (Bomgardner's,)	(65)	14
Bender,	(365)	125
Benson & Cottrell,	(—)	111
Benson & Cottrell,	(—)	114
Blessinger,	(147)	74
Bollinger, J. & D.,	(232, 233, 234, 235)	94
Boyer, David,	(284, 285, 286)	61
Boyer, Samuel,	(238)	96
Brillhart,	(50, 51, 52, 53, 54, 55,)	11
Brodbecks,	(115)	—
Burg, Reuben,	(39)	20
Butcher, (or Barcroft,)	(74, 75)	24
Cameron Company,	(14, 15, 16, 17)	6
Case, W. G.,	(46)	8
Clark, (widow,)	(307, 308)	66
Corr,	(159, 160)	81
Cottrell & Benson,	(—)	111
Cottrell & Benson,	(—)	114
Crout, David, (Musselman & Watts,)	(104)	40
Curren, James,	(—)	7
Deitz, Jacob,	(148)	78
Deitz, Samuel,	(149)	97
Delone,	(256, 257)	57

Name of the mine.	Label Nos.	Map No.
Early & Killinger,	(295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305)	64
Ebert	(161, 162)	81
Eckert & Kauffman,		54 *f*
Eisenhart, Jacob,	(197)	83
Emig, John,	(67)	17
Emig, John,	(—)	18
Emig, S.,	(227, 228)	86
Ensminger,	(79, 80)	28
Eyester,	(—)	85
Falkenstein, Daniel,	(93)	33
Feigley,	(53, 54, 55)	12
Flickinger,	(116)	51
Flickinger,	(—)	56
Forney,	(259)	58
Forrey,	(242)	95
Forrey,		54 *a*
Fritz, Susanna,	(157)	79
Geisselman,	(94)	37
Gitt,	(256)	108
Gladfelter,	(49)	10
Gladfelter,	(97, 98)	36
Gohn,	(136, 137)	67
Green Ridge,	(368)	
Grubb,	(142, 143)	110
Hake,	(176)	113
Haldeman, E.,	(251, 252)	102
Hanover Branch Railroad,	(251)	50
Harman,	(184, 195, 196)	
Heck,	(367)	
Heidelbach,	(158)	80
Heistand,	(146)	73
Help,	(10, 11)	3
Hengst, Samuel,	(77)	26
Hess, S.,	(91, 92)	32
Hoffacker,	(56, 57, 58, 59, 60, 61, 62, 63)	13
Johnson, W. S.,	(—)	87
Kauffman,	(217 to 223 incl.)	84

Name of the mine.	Label Nos.	Map No.
Kauffman,	(—)	103
Kauffman & Eckert,		54 *f*
Keeny,	(13)	5
Keller	(144)	72
Keller, George,	(68, 69, 70, 71, 72)	19
Keller, John,	(46)	23
Killinger & Earley,	(295 to 305, inclusive)	64
Knotwell,	(110)	41
Knotwell,	(—)	43
Kraber & Nes,		54 *h*
Krumrein,	(290, 291, 292, 293, 294)	63
Lamott,	(12)	4
Landis,	(356)	
Leader, G.,	(86, 87, 88, 89)	31
Leber, Daniel,	(66)	16
Lefever,	(310)	62
Lefever, Enoch,	(309, 311)	65
Lichte,	(334, 335)	120
Lightner,	(177)	115
Logan,	(360, 361)	122
Louck,	(166, 167, 168, 169)	116
Louck,	(170, 171)	118
Louck, Daniel,	(165)	82
Margaretta Furnace,	(40, 41, 42, 43, 44, 45)	22
M'Conaughy, (Slagle's farm,)	(272, 273, 274)	109
M'Cormick,	(—)	126
Mengis, Andrew,	(236)	88
Meyer, B.,	(—)	34
Meyers, Matthias,	(—)	53
Meyers, Michael,	(230, 231)	89
Meyers, widow,	(—)	9
Mickley,		54 *e*
Miller,	(—)	76
Miller, widow,	(—)	106
Miller, J. L.,	(253, 254)	92
Mine, (Altland,)	(346, 347, 348, 349, 350)	121
Moser, (new)	(78)	27

Name of the mine.	Label Nos.	Map No.
Moser, (old)	(81, 82, 83, 84, 85)	29
Moser, (oldest)	(—)	30
Moul, J.,	(243, 245, 246, 247, 249)	98
Moul, P.,	(248)	100
Moul, Sol.,	(255)	99
Mumper,	(359, 363, 364)	123
Musselman & Watts, (Crout)	(104)	40
Nes's hill,	(118)	54
Nes & Kraber,	-	54 *h*
Norse,	(145)	75
Porter, Ex. Gov.	(355)	
Reading Coal and Iron Company,	(351)	
Reilston,	(5)	2
Roth, J.,	(229, 175)	91
Roth, S.,	(—)	90
Ruby,	(140, 141)	71
Rudesill,	-	54 *d*
Rudy,	(138, 139)	70
Schaeffer, Jacob,	(—)	45
Schueman, J.,	(117)	52
Schwartz, Samuel,	(279, 280, 281)	59
Schwartz, Solomon,	(283)	60
Schwartz and Boyer,	(—)	—
Small, John,	(73)	21
Smyser, (Small,) (Ashland Co.,)	(151, 152, 153, 154, 155, 156)	112
Smyser, (Benson & Cottrell)	(—)	111
Smyser,	(—)	117
Smyser, E. G.,	(—)	49
Smyser, (Kauffman,)	(217 to 223 inc.)	84
Smith, W. R.,	(330, 331, 332, 333)	119
Sprenkle,		54 *i*
Stambach,	(95)	35
Stambach,		54 *b*
Stoner,	(—)	69
Stover,		54 *g*
Strickhouser,	(111, 112, 113)	42
Strickler, Benjamin,	(—)	68
Thomas Iron Company,	(99)	38

Name of the mine.	Label Nos.	Map No.
Thomas Iron Company,	(107)	46
Thomas Iron Company,	(108)	47
Thomas Iron Company,	(109)	48
Trone,		54 *c*
Underwood,	(357, 358,)	124
Walker, A. P.,	(353, 354)	
Walter,	(103)	39
Williams.	(49)	10
Wilton, Harris,	(—)	15
Wirt, Henry,	(264)	
Wolf,	(366)	
York Iron Company,	(114)	44
Young,	(4)	1

1. *Young's opening,** (*II, 28.*)

This is on the property of Mr. John Q. Young, *one mile south* of Shrewsbury station on the Northern Central railroad.

As the star (*) attached to this name in the column of ore banks on the edge of the map indicates, this is not a mine, strictly speaking, but a locality, whence rock has been obtained exhibiting the essential features of the Help ore, but not containing so much pyrites or magnetic iron. This rock has the appearance of a greenish gray granular chloritic schist, with more or less impregnation of iron. The opening had so far been filled up, that its character was only to be inferred by loose fragments lying around the mouth of the excavation.

A few tons had been removed, but no accurate account of its behavior was obtained. Dip, west 25° north.

2. *Reilston's Bank.* (*II, 28.*)

This property was leased by A. Bauchman, and is situated four miles south-west from New Freedom, and one-eighth mile or more over the Maryland State line.

The excavation was in mica schists, dipping south 20° east 45°. The ore, which was a brown hematite, occurs in lumps and small fragments scattered through the clay walls of the bank, and was of a dark black sandy appearance.

Another opening was observed in a field about 45° northeast of the main bank, the ore from which seemed of the same character as that just referred to.

3. *Help Mine.* (*II 27.*)

This is an excavation on the side of a hill, about three-quarters of a mile north of Shrewsbury station, Northern Central railroad.

The rock here appears to have the character of a transition from a hard and compact gneiss to a green arenaceous chlorite slate. As in many belts of these slates elsewhere, there are found numerous crystals of magnetite, and also some pyrite. Throughout the mass are observed scales of hydro-mica and detached grains of sand from the partial weathering of the rock. This rock, which is the "ore," appears to be very susceptible to the action of the weather and changes its character very much within short distances when followed into the hill.

The prevailing dip is north 45° west; 40°.

Some fifty tons more or less of this rock are said to have been removed for treatment for its iron, but in what way or with what results could not be ascertained.

A large number of specimens of this "ore" were collected and forwarded to the laboratory of the Survey for analysis. The results of Mr. M'Creath's investigation were as follows:

	Per cent.
Silica,	50.150
Protoxide of iron,	10.475
Sesquioxide of iron,	7.324
Pyrites, (iron di-sulphide)	1.818
Copper sulphide,	0.060
Manganese sesquioxide,	0.480
Alumina,	7.391
Lime,	6.350
Magnesia,	5.686
Carbonic acid,	4.420
Phosphoric acid,	0.201
Sulphuric acid,	0.016
Titanic oxide,	1.260

	Per cent.
Alkalies,	2.190
Water,	2.142
Sum,	99.963
Loss,	0.037
	00.000

This gives:—

	Per cent.
Metallic iron,	14.125
Metallic manganese,	0.334
Metallic titanium,	0.768
Metallic copper,	0.029
Sulphur,	0.988
Phosphorus,	0.088
Magnetite separated by magnet,	4.360

4. *Lamott's Ore-opening.* (*II, 45.*)

This is situated about six miles west of New Freedom, and one-half mile north of the State line.

The ore taken from an excavation south of and close to the road near Lamott's is said to have been of very good quality, but not in large quantity. The opening is now filled with dirt, and the only specimens obtained were from the loose debris around its mouth.

5. *Keeney's Bank.* (*II, 45.*)

This bank, leased by Miley & Nuttons, is situated on the State line, about three-quarters of a mile from Lamott's house.

It has been operated for about three years, and was in active operation in August, 1874.

The ore is a brown hematite or limonite, and is found lying in lumps and earthy concretions in a mass of clay. The dip of the adjacent strata appears to be about north 25° west; 45°.

About twenty-eight tons can be mined per day and sent to Lebanon. Practically, all the ore is washed, though not unfrequently lumps of various sizes and good quality are found imbedded in the clay. The mining of this employs the services of five men, at wages of $1 15 per day. The ore is taken out by two carts from an open cut. Twelve men in all are employed. Only eighteen to twenty tons were being taken out at the date of the inspection of this mine.

6. *Cameron Company's Bank.* (*II, 45.*)

Situated a quarter of a mile from Wentz's store, in Baltimore county, Md., just over the State line.

This bank had also been opened about three years previous to August, 1874, but was not then in operation, and was full of water.

Specimens from the dump pile were obtained, which promised a very good quality of limonite. The rock with which the ore occurred was crystalline schists weathered into clay. No exposures permitted the determination of the dip.

7. *James Curren's Bank.* (*VIII, 48; V, 74.*)

Situated about one mile south of the Margaretta furnace.

This bank was opened about thirty years ago, by Eckert & Guilford, owners, who worked it but a short time and sold it to George Heindle, who worked it three or four years and sold it to John Givens. John Givens, after working it about the same length of time, sold it to the present owner, Jas. Curren, of Wrightsville. It has lain idle for ten years or more. Ore shelly limonite occurring in clay.

8. *W. G. Case's Bank.* (*VIII, 48: V, 74*)

This bank was opened by Curren & Evans, twenty-three years ago and was worked by them two or three years. The property owned by Jacob Keller, was then leased to Mr. Eagle, of Marietta, who worked it about two years. Mr. Case, of Columbia, then bought the property of 198 acres, including the bank, and worked the latter some months himself, since which time the bank has been idle. The ore which is exposed in the bank ten feet from the surface, is a shelly limonite, said to be magnetic, but the specimens obtained did not exhibit this property.

9. *Red Lion Summit Openings.* (*X, 78.*)

On the Peach Bottom railroad, on property owned by widow Meyers, at Red Lion Summit, a very ferruginous schist was found, which almost deserves the name of an ore and lies well in the third range of ores as given in this report.

The only points at which the ore was prospected, (except in the railroad cut,) were several openings in the woods not far from this station, where openings had been made and had filled up, but the debris around the mouths of these excavations showed no sign of the existence of a serviceable ore, to say nothing of its quantity..

10. *Gladfelter's (old P. Williams') Bank.* (*IX, 17; IV, 91.*)

This bank is very old, not having been wrought for more than forty years. The property which includes it is owned by Gladfelter. An immense amount of ore must have been obtained from it, as the excavations are numerous and both deep and extensive. It is no longer wrought.

11. *Brillhart's Bank.* (*IX, 20: IV, 90.*)

Situated one and a half miles east north-east of Logansville.

This bank is leased and worked by C. S. Kaufman, for Columbia furnace. One engine of 15 horse power and 15 men are employed in getting out the ore. The ore is almost entirely wash ore, and of good quality. It so nearly resembles that of the larger Feigley mine, which is a continuation of the cutting, that both can perhaps be better described under this head.

12. *Feigley Bank.* (*IX, 20; IV, 89.*)

This extensive bank, which adjoins and in fact runs into the preceding, was opened by Musselman seven years ago. Its proprietors have been Musselman, Denny, Hess and Kaufman.

About fifty thousand tons of ore have been removed. The ore is a limonite for the greater part, finely disseminated through a mass of clay, which in some places has been penetrated for forty feet or more. This ore occurs in irregular segregations through the clay, and is more than 90 per cent. wash ore. The lump is of the same character, quite hard, but so intimately intersected by seams of clay that its per cent of iron is not quite as high as that of the washed ore.

A dark blue compact and heavy argillaceous ore occurs here also, which is said to contain a higher per cent of iron than the limonite itself.

There is also to be found a peculiar "honey comb ore," consisting of minute plates of the limonite, so intricately knit together as to give the general appearance of a wasp's nest.

About twenty-five men, at $1 20 per day, including every one, and forty horses, are employed. The ore is hauled to Gladfelter's station, Northern Central railroad, a distance of four miles, and at a cost of about 95 cents per ton. Three engines are in use, of 20, 15 and 10 horse-power respectively, consuming about 40 tons of bituminous coal (say $250) per month. An inclined plane carries it to the washer from the mine, where it lies in nests and pockets.

There is generally no trouble from water, enough being obtained to supply the washers and not enough to interfere with the operation of mining.

The ore is all shipped to Columbia furnace, and mixed with Cornwall ores makes a neutral foundry and forge iron. When melted alone it makes a very good foundry iron.

The greater part of the forge iron is sold in the neighborhood of Columbia, while the market for the foundry is further east. The price of this latter is usually about $1 00 less than that from the Lehigh district.

An analysis of an average sample of the ore, by Mr. J. Blodget Britton, of Philadelphia, showed:

	Per cent.
Metallic iron, - - - - -	46.080
Oxygen, - - - - - -	19.740
Water and organic matter, - -	10.940
Insoluble siliceous residue, - -	18.660
Sulphur, - - - - - -	None.
Phosphorus, - - - - -	0.690
Alumina, - - - - - -	1.920
Lime, - - - - - -	0.170
Magnesia, - - - - - -	0.560
Manganese, - - - - -	0.330
Undetermined, - - - - -	0.910
Total, - - - - - -	100.000

An interesting feature of these two banks (really but one) is the occurrence in them of a finely bluish laminated limestone, containing white crystaline limestone scattered through it in spots, resembling in certain portions a calcareous conglomerate, while in others it bears the appearance of being simply mottled.

This limestone in the Feigley bank and also in the bed of the little run flowing through this valley, dips about north 20° west; 85°.

In an excavation on the face of a hill from which it was quarried (about quarter of a mile east of the dump pile at Brillhart's) it is so intercalated with flakes of crystalline hydro-micas resembling those of the schists, as to be almost unrecognizable, although containing over 78 per cent of the carbonates of lime and magnesia.

An analysis of this rock will be found at another place.

The dip of the fine laminæ both in the bed of the creek and in the quarry just referred to, is about north 20° west; 85°.

The thickness of this bed is difficult to ascertain, but it is probably not much over 400 feet.

Another interesting, though not unusual feature of this bank is the occurrence of decomposed slates and adhesive clay, as the matrix in which the ore is imbedded.

The latter is clearly but the ultimate stage of alteration of the former, and its relation to the limestone leaves no doubt about the horizon in which the two occur, while the parallelism which it exhibits to other occurrences of ore elsewhere throws light on the whole subject of the genesis of these limonites below the great Lower Silurian (Upper Cambrian) limestone valleys.

13. *Hofacker's Bank.* (*II, 43; IX, 63.*)

The old opening wrought eighty or one hundred years ago, lies about seven miles south-east of Hanover, and three miles north of the Maryland line.

This is an extensive quarry, in hard indurated chlorite slates, intersected by numerous quartz veins, and studded with pyrite and (in places) chalcopyrite. The rocks here are nearly vertical, and strike about north 20° east.

About nine hundred feet north by east from this old opening, the Wrightsville Iron Company has leased and opened a bank. Work was commenced in April, 1874, but in October, but four

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men were employed at one dollar per day of eleven hours, and about four tons were produced daily.

The ore is mostly limonite with some magnetic, and is cold short. It occurs in regular bed and not much of it needs washing.

It is driven out of the open cut by carts, and transported to Black Rock Station, Bachman Valley railroad, a distance of two and a half miles. The ore is all used by lessees.

The apparent dip of crystalline schists in the cut, is east 20° south; 50°. But in the quarry where the basset edges are finely exposed, their dip is vertical with the same strike of north 20° east.

14. *Benade's Shaft.**

About three-fourths of a mile south-west of the Hofacker openings is a shaft sunk by Mr. Benade of Hanover, from which about one and a half tons of ore have been taken, on Eli Bomgardner's property. No ore in paying quantities is in sight at present. The shaft is about twenty-eight feet deep and rock at the bottom is much contorted. Two men are employed. Boulders of quartzite abound in the neighboring fields, but no exposure was found on which to base reliable data for structure.

The specimen of ore from this pit is a very coarse shaly slate, impregnated with ferric hydrate sufficiently to give it the right to the title of a lean ore.

15. *Wilton's Bank.* (VIII, ss.)

Situated about one and a quarter miles south-east of Wrightsville, and one-third of a mile from the Susquehanna.

It was opened in 1850, and wrought then, and subsequently in 1855 and 1858. About 12,000 tons of brown hematite have been taken out by Henry Wilton, who leased the property from Jabez Jenkins. The mine, together with 149 acres of land on which it occurs, are owned by Harris Wilton. At present no work is being done, and there is no machinery at the pit mouth, but it has fallen shut, and is now partly covered by vegetation.

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* *Work on this opening has been suspended since the above observations were made.*

A large deposit of ore is said to be found at 65 feet below the surface.

No specimens were found about the opening which would convey any accurate idea of the nature of the ore.

This ore occurs in a ravine about 700 feet wide at the mouth, (a terrace of 50 feet occupying the southern side,) while the enclosing slate hills are high and abrupt.

The exploitation for ore was first made at the point marked *j*, on the sketch. A tunnel was afterwards driven in to connect these various shafts and drain the mine. This has long since fallen shut. The belt of limestone so often referred to, strikes across the northern half of the ravine about east 10° north, and along the bed of the run.

The shaft *h*, was sunk 55 feet to a bed four feet thick, *dipping with the slates.*

At *i*, about 100 tons were taken out.

j, The original shaft has been closed for fifteen years or more. About 700 or 800 tons were taken out here.

k, Was the western limit of the tunnel, but has now fallen in.

At *c*, a shaft 70 feet deep was sunk, where a bed of impure gritty kaoline clay about 18 feet thick was passed through.

In the same shaft about 20 feet beneath the surface, a bed of nine feet of red clay was passed through. The white clay seems to strike north-east and south-west and the red about east and west.

16. *Daniel Leber's Bank.* (*VIII*, *37*; *V*, *75*.)

A little over three miles south south-east of Wrightsville, and little over half a mile from the Susquehanna river.

This shaft was opened one year ago and was leased to Skills & Fry. Three men were (September 22) working in it and getting out considerable quantities of ore, which is mostly lump ore. The character of the specimen selected for the cabinet is that of a compact, testaceous, hard limonite. Here, as in a few other localities in this county, the concretionary character of the limonite is well exhibited by plates or concentric shells of ore, separated by layers of clay. Where these have been worn or broken there is frequently left a ring ot ore of which the central portion is usually missing.

The ore is got out at present by means of a windlass.

The soil in the vicinity of the mine was of a dark brown color, due to fragments of wash ore on the surface.

About 1,050 feet south 15° west from this pit, limestone in place exhibits a dip of south 22° east; 40°. This is the continuation south-westwardly of a fold in the Auroral limestone at Cabin Branch run.

West 30° north 570 feet from Leber's is

17. *John Emig's Bank, No.* 1. (*VIII, 38; V, 74.*)

This has completely fallen shut, not having been in operation for seven years. A specimen was obtained from the dump pile.

Here again the persistency of these beds near the junction of the lower slates with the Auroral limestone, is well marked.

18. *John Emig's Bank, No.* 2.

Situated about a quarter of a mile west of Jas. Emig's bank on the north side of the Margaretta furnace and Wrightsville road. This bank is very old and has been for five years abandoned.

There is no machinery there, and the buildings are in a state of decay

The shaft is said to have been 110 feet deep, and the ore is said to have been so hard and tenacious at the bottom that blasting was necessary. It is also said that there was very little wash ore but that most of it was Brown Hematite lump.

It had been leased to Hildebrand, of West Chester, but the lease had long since expired and had not been renewed.

19. *George Keller's Shaft.* (*VIII, 39.*)

Situated about two and a half miles from Prospect and four miles from Wrightsville.

The shaft was opened about ten years ago, and was leased first to the Wrightsville Iron Company. It was afterwards leased to Skills & Fry, of Lancaster, but their lease has now expired. Two shafts have been sunk; the one seventy feet deep and the other thirty feet deep. Almost all of the ore is said to be lump ore and must be blasted. It occurred very near the surface of the ground.

The water is pumped and the ore is raised from these shafts by horse-power.

The gangue seems to be hydro-mica slate partly reduced to a very sandy condition and among the debris around the pit mouth occur many lumps of quartzite covered with a film consisting of small dark green crystals.

The ore is magnetic to a large extent.

A highly crystalline limestone crops out in the immediate vicinity having a dip of south 22° east; 54°.

20. *Reuben Burg's Bank.* (*VIII, 42.*)

Situated about three and a half miles a little east of south of Wrightsville, and a little over one and a third miles north of east of the Margaretta furnace.

The ore shaft was opened about three years ago, (by whom was not ascertained.)

There is at present no lease on the property.

The ore was found in lumps in the bottom of the shaft, thirty feet from the surface.

The specimen obtained was a limonite, charged with much magnetic iron, which strongly affected the needle.

21. *John Small's Bank.* (*VIII, 49; V, 73.*)

Situated about one-half mile west of the preceding, and about the same distance north-east of Margaretta furnace.

Mr. Slaymaker originally owned this bank, but it was purchased some fourteen years ago by Mr. Small, whose son has wrought it himself for about two years. The ore resembles that of the Margaretta furnace banks, especially the black ore from that vicinity. There is no engine used here, but the water is pumped and the washer is driven by horse power. The lump and wash ore are about equal in the production of this bank. The distance to shipping station and cost of transportation are about the same as for the Margaretta furnace.

The teams are owned by J. Hoke, who charges 90 cents per ton for hauling.

There is no trouble derived from water, neither too much to permit proper working nor too little to supply the washer.

The greater part of the ore is shipped to Havre de Grace, and used by Whitaker & Sons. It is hauled out of the bank by carts. The ore is used for the manufacture of foundry iron, and is sold for $4 00 per ton at the canal. The excavation is close by the Margaretta-Wrightsville road.

22. *Margaretta Furnace Banks.* (*V, 73; VIII, 49, 50.*)

These banks were opened by Mr. Slaymaker. Those nearest the old furnace were purchased twenty-four years ago by Hahn & Himes, of whom the latter still resides in the mansion house. These gentlemen have been working the banks for seven years.

The ores are various forms of limonite, turgite and the iron hydrates generally. They are brittle, arenaceous and shelly, and pass by insensible gradations into the slaty gangue in which they are imbedded. They are said to contain 45 per cent. of metallic iron. The black ore (a purer variety) is said to yield near the theoretical limit, or 60 per cent.

About 200 tons per week were obtained, but the ore was brought out in carts, there being no engine except one of 50 horse power at the furnace.

Charcoal was employed for the reduction of these ores, and the heat for steam generation was procured by leading the ignited gases from the tunnel head beneath the boilers.

All the ore sold was transported to tide water canal, distant two miles, at a cost of $2 00 per ton. The teams were owned by the company. The iron made at the furnace itself was foundry, and it was used for hollow ware and sold to the Baltimore market. It is said to have run very well: there was no better iron for this ware. It worked very soft in the furnace.

There was not too much water for mining purposes, but the pump was constantly employed. The ore lies in bunches or nests in a very much decomposed slate, or in clay to which they have been converted. The black ore, though smaller in quantity, is more regular where it occurs, and seems to have filled cavities between the strata.

The gangue is mica slate, but is not exposed in a sufficiently undecomposed state to permit its actual dip to be determined.

The foundry iron produced here fetched $55 per ton 18 years ago.

No analyses were obtained of this ore.

An average sample of the ore collected by Mr. Himes, and shipped to Mr. M'Creath for analysis, gave the following result:

The ore was a brown hematite of shelly structure, containing cavities filled with göthite, etc., and also free quartz. The analysis showed:

	Per cent.
Insoluble residue,	15.630
Sesquioxide of iron,	69.714
Alumina,	1.422
Manganese sesquioxide,	1.135
Phosphoric acid,	0.844
Sulphuric acid,	0.095
Lime,	0.106
Magnesia,	0.194
Water,	11.100
Total,	100.240
Metallic iron,	48.800
Metallic manganese,	0.790
Sulphur,	0.038
Phosphorus,	0.343

The analysis of the ignited insoluble residue gave:

	Per cent.
Silica,	12.870
Iron sesquioxide,	0.250
Alumina,	1.830
Lime,	0.020
Magnesia,	0.120
Ignited insoluble residue,	15.090
Loss,	0.540

23. *John Keller's Bank.* (*VIII. 55.*)

Situated about one and three-fourth miles a little north of west of the Margaretta furnace.

It was opened eight years ago by Mr. Keller himself, since which time about 1,000 tons of ore have been taken out, all within the first six months of its opening. No work has been done in the mine since that time. There is no machinery at the bank. Completely fallen shut. Just north of the bank very ferruginous slates dip south 20° east; 70°.

24. *Dr. J. W. Barcroft's (sometimes called Butcher's) Bank.*

(V, 71; VIII, 55.)

This bank lies two miles north of west of the Margaretta furnace, adjacent to the claim of Hahn & Himes, and about 500 feet south-west of Keller's. The bank was originally owned by H. J. Slaymaker and has been thirty-four years opened. It was leased to J. Eagle, of Marietta, who suspended work in it six years ago. The ore is cold-short, of plate-like structure, hard, flinty and tenacious, and shows an unusually large amount of black glassy coating and innumerable small mamillary stalactites, besides knobs and ridges. The edges of these plates very generally show the fibrous structure of göthite. A large portion of the ore must have been lump, as it lies in the clay in deposits of large size, and tolerably regular as a whole, though the massive ore bed is itself but a belt of irregular crescent-like masses dipping in slates about east 10° north; 30°. The slates are very much decomposed, and in many places are reduced to fine clay. A portion of the upper layer of the bed is composed of glassy limonite and turgite.

The ore was shipped to Emig's station, and would cost now $1 50 per ton for transportation, but was hauled at the time the bank was last in operation for $1 12 per ton. The railroad charge is about two cents per ton per mile. It was used in Mr. Eagle's furnaces at Chickies, near Columbia. Water did not interfere with the working. A rotten slaty limestone occurs near this bank.

Musselman & Watts worked this bank for some time, and extracted from it about 10,000 tons.

An analysis furnished by Mr. Watts, shows:

	Per cent.
Silica,	26.750
Peroxide of iron,	47.150
Alumina,	1.700
Water,	11.400
Sum,	87.000
Undetermined,	13.000
Total,	100.000

This corresponds to

	Per cent.
Metallic iron, - - - - - -	33.005

25. *Christian Barley's Bank.* (*VIII, 59.*)

Situated about one mile west of the Barcroft bank.

It had been opened about six years ago, at which time Mr. Brillinger was the lessee. It was used occasionally for about two years, during which time about 400 tons of ore were taken out. It is now leased. No outcrops were observed. The specimen from this bank is a compact dark brown hematite with much clay.

26. *Samuel Hengst's Bank.* (*VIII, 60.*)

Situated about 900 feet south of west of Barley's.

It was opened about six years ago, by Stahm, Keller & Leon, who worked the bank for three years, during which time they got out in the neighborhood of 3,050 tons of brown hematite ore. The bank has lain idle without lease ever since.

The specimen taken was a coarse conglomerate, containing much segregated limonite, with adhering ferruginous slates. The excavation is about fifteen feet deep.

27. *Moser's (new) Bank.* (*VIII, 15; V. 56.*)

Situated about two miles south south-east of Longstown, and four and a half miles east south-east of York.

It was opened nine years ago and leased by Mr. Myers of Marietta, but has not been worked for some years. The clay banks and bottom are much covered by vegetation. The engine house is still standing, although the machinery has been all taken away. The exposure is very poor, but the ore is seen in places in the sides of the pit. The specimen obtained from this bank was a pale buff limonite, containing the other hydrated oxides of iron and much clay.

28. *Ensminger's Openings.*

Situated, the one west 1,000 feet, and the bank proper 1,700 feet south-west of Moser's new bank.

The east bank was opened eight years ago, by H. K. Storm & Price. It was re-opened last fall, 1873 by Mr. Powell of

York. It has never been properly worked. Some of the ore has been sold to Myers and to Hess. It is thought to be a "vein" by Mr. S. Ensminger, by which is to be understood that the ore is tolerably regular and continuous. The best specimen which could be obtained from the new opening, was a limonite with much associated clay. That from the old opening was a compact dark brown limonite.

29. *Moser's (old) Bank.* *(VIII, 11; V, 54.)*

This bank lies a little less than four miles south-east of York, and but a few hundred yards west of the Peach Bottom railroad. The character of the ore is very various, accompanied, near the western heading, by masses of quartz and decomposed argillites, stained by iron oxide. The excavation, which is of very great size, has almost entirely fallen shut, and the sides are obscured by the wash from above, while there is a considerable amount of water in the bottom. The sides are mainly composed of yellow, white and blue clays, in which large boulders of ore are observed. The bottom is strewed with lumps, of which much is compact and lean. The length of the bank is about 250 yards, the deepest part being at the north-east end. The amounts of lump and wash ore obtained from this bank were about equal.

This bank was originally opened about fifty years ago and worked, first by the York Furnace Co.; second by Jno. A. Wright & Co.; third by Schönberger, Musselman & Co.; fourth by Musselman & Watts, and fifth by Musselman & Sons.

The total yield of iron from the time Schönberger, Musselman & Co. purchased the bank, in 1850, was 42,090 tons.

The ore was hauled to York at about $1 00 to $1 25 per ton. The load was 3 to 5 tons. The hauling was done by John Strine, who owned an interest in the bank. It was taken out of the bank both by carts and inclined railroad. It was used by Musselman in his furnace at Marietta.

One specimen obtained from the weighing platform of this bank, exhibited parallel flat plates united together by one or the other edges, the space between being filled with lepidocrocite and stalactite limonite and turgite. Another was of botryoidal appearance, and covered with black glassy turgite(?) A third was a compact brownish black limonite. A very large specimen, weighing fifty or sixty pounds, exhibited all these peculiarities together, and also a peculiar septated structure, the ridges being an inch or more in height, and uniformly covered with glassy ore.

A partial analysis furnished by the Messrs. Watts was as follows:

	Per cent.
Metallic iron,	40.000
Silica,	32.700
Sulphur,	trace.
Phosphorus,	1.170
Water,	8.070
Sum,	81.940
Undetermined,	18.060
Total,	100.000

30. *Moser's (oldest) Opening.* (*VIII, 11.*)

A still older opening is seen just across the road (about 200 feet,) W. of the S. W. end of the "Old Moser Bank," about which no information was obtained. It is more than probable that this bank was a part of the operation of Musselman & Co., and the ore is of course of the same character as that in the larger bank.

The specimen obtained from this old opening was a compact dark brown limonite.

George Leader's. (*IV, 73.*)

About one-half mile E. of the Baltimore turnpike, on the East Branch of the Codorus creek, occurs a coarse conglomerate of slate and crystalline schist imbedded in a ferruginous matrix almost worthy of the name of an ore. The dip appeared to be E. 20° S. 42°.

This is mentioned among the ore localities because it is on the strike of the range now being followed from Leber's to the line of banks along the Hanover Branch railroad, and is an exhibition of an unusually ferruginous rock.

This ferruginous conglomerate deflects the needle slightly.

31. *Leader's Hill.* (*III, 21; IV, 84.*)

An old opening on the side of a hill, three-quarters of a mile N. W. of New Paradise. Slates dipping E. 20° S. 84°. No ore showing.

32. *Samuel Hess' Bank.* (*IV, 78.*)

This excavation lies about five miles due south of York and about two miles north-west of Logansville. The main excavation is about 150 feet long and 15 feet deep in slates. It was opened five or six years ago, and was first leased by the Thomas Iron Company, but the lease ran out and was not renewed as the ore was pronounced too sandy

The slates here strike about north 20° east almost vertical. The specimen was a brown sandy hematite. The slates in this vicinity are asbestiform.

33. *D. Falkenstine's Shaft.* (*III, 1.*)

This was an old abandoned shaft about three-quarter miles south-east of Gladfelter's station Northern Central railroad. The farm had been leased to Mr. C. P. Kauffman of Columbia. A body of ore is said to exist about 1,000 feet north.

No developments had been made, and the only specimen obtained was a sandy slate, highly impregnated with iron oxide.

34. *B. Meyer's Opening.* (*III, 6.*)

This is a small excavation to the west of the railroad, and about 1,200 feet north-west of Gladfelter's station. Mr. B. Meyer obtained a lease and gave Messrs. Landis & Cameron the contract to work it. The slates which form this ore strike about north 30° east and stand vertically. From an analysis reported to have been made in Philadelphia, it was ascertained to contain 35 per cent. of iron.

35. *Stambach's Shaft.* (*III, 3.*)

Situated about a quarter of a mile west of Gladfelter's station Northern Central railroad. This is merely an exploitation shaft from which have been obtained dark colored slates, with small crystals of micaceous and magnetic iron ore.

36. *Gladfelter's Bank.* (*III, 5.*)

Situated about three-quarters of a mile west of Gladfelter's station Northern Central railroad. This is merely a pit some ten feet deep, exposing vertical slates, with a strike of north 34° east. A specimen of limonite was obtained.

37. *Geisselman's Bank.* (*IV, 7.*)

Situated about one-fourth of a mile from the railroad, between Gladfelter's and Seven Valley (Smyser's) station.

Four small shafts have been sunk about four years ago, and were worked by Landis & Cameron, for about two years. They have filled up now and are no longer in operation. The specimens obtained were hydro-mica slates impregnated with oxide of iron.

38. *Gladfelter's Ore, Thomas Iron Company.* (*IV, 8.*)

The operations of the Thomas Iron Company on Geisselman's farm, about one-fourth of a mile south-west of Smyser's, or Seven Valley station, comprise two ore-pits or open cuts, and three shafts.

In the bank the slope has been continued 200 feet in depth, and three drifts have been run into the ore. The north-easterly bank is 25 feet deep, with a shaft at its lower extremity of 30 feet. These are not at present being worked. The next bank, a few hundred feet south-west is also disused, but the shaft just east of it and 15 feet deep, is furnishing ore. The first of these banks covers an area of a little less than half an acre and the latter an area of about three-fourths of an acre.

At the north-east heading of the next bank south-westward, is an engine house at the head of the inclined plane. This bank covers an area of about one and one-fourth acres.

An analysis of this ore, kindly furnished by Mr. Mickley, of the Thomas Iron Company, Hokendauqua, is as follows:

	Per cent.
Metallic iron, - - - - - -	51.700
Sulphur, - - - - - - -	none
Phosphorus, - - - - - - -	0.052
Silica, - - - - - - - -	6.000
Alumina, - - - - - - -	16.400
	74.152
Oxygen, water and organic matter, (?)	25.848
Total, - - - - - - - -	100.00

The specimen of this ore, selected for the cabinet, was a hard brown compact hematite, containing included clay.

39. *Walter's Bank.* (*VI, 19; IV, 13.*)

Situated about three-fourths of a mile north of west of Hanover Junction station, Northern Central and Hanover Branch railroads.

It had been leased by Searle & Findlay, but was abandoned about a year ago, though in August it contained comparatively little water.

The ore lies in loose decomposed schists, in irregular bunches or segregations. The sides are much washed down, but considerable quantities of hard limonite can be seen in the west heading, in places when it appears to descend at a steep angle west of north. The hanging rock and the foot rock are of a very much decomposed sandy slate. The bank covers an area of about three-fourths of an acre, and is about 40 feet deep. The engine house is still standing.

It was said that this bank was about to be again worked by Mr. John S. Davis, of Gettysburg.

The best specimen which could be found was a coarse grained slate highly impregnated with oxide of iron.

40. *Daniel Crout's (Musselman & Watts') Bank.* (*IV, 48.*)

Situated about one-third of a mile north-east of Strickhouser's station, Hanover Branch railroad.

It is an irregular excavation for over 800 feet along the side of the road, which had been leased by Mr. A. H. Musselman, some years ago, and worked at irregular intervals since. The sides had almost completely fallen in, and a considerable amount of water was in the bottom. It is about 18 feet deep at the eastern end.

The specimens obtained were a hard, compact, arenaceous limonite.

41. *H. R. Knotwell's Shaft.* (*IV, 46.*)

Situated on the hill in which the York iron company's operations are conducted, and about one-half a mile to the eastward of Strickhouser's ravine.

This shaft, (8x4 feet) which was being sunk in August, was in hard ore and had reached a depth of 27 feet. Cribbing extends from the top.

The farm on which this shaft is being sunk was leased 13 years ago by its owner, Mr. Strickhouser, for 99 years.

In August no ore had been shipped from here.

There has been employed on this work for two months, nine men at $1 12 per day, and one foreman at $2 00 per day.

The ore from here is identical with that of the York iron company.

This operation has been abandoned since the date above alluded to.

42. *Strickhouser's Opening.* (*IV, 46.*)

This is a shaft in the woods, about 1,200 feet west, a little west of south, of Knotwell's shaft. Opened about 13 years ago. No exposures give the dip with certainty. Probably nearly vertical. Strike about north 40° east. It has been leased by Mr. Knotwell, of New Haven, Ct., but is not wrought at present.

The ore is of the same quality as that of the York Iron company's mine.

One excavation which bears north 39° east, and is 200 feet long, 30 feet wide and 10 feet deep. There is a shaft in the middle 10 feet deep.

43. *Knotwell's Opening.* (*IV, 49.*)

Situated about 1,600 feet a little west of north of the excavation of the York Iron company, near Strickhouser's station. The opening is about 200 feet long, running from the mouth in a south-east direction, and is hauled out by cart.

Dip in the bank, east 8° south; 66°.

At another exposure in the vicinity the strikes appeared to be about north 20° east.

44. *York Iron Company's Mine.* (*IV, 49.*)

This is the most widely known bank in York county, and its ore is familiar to iron masters under the name "Codorus Ore."

The "Codorus," "Strickhouser," or York Iron Company's Mine, was originally opened in 1854 by John Musselman, but has since been purchased by the York Iron company, of York, Pa., which has worked it more or less continuously since 1861, and continuously since May, 1873. The ore consists of a hard, compact slate, highly charged with micaceous and some magnetic ore.

The following statements were furnished by Mr. Kraber of the York Iron Company:

From 10 to 20 tons are mined per diem, but this amount might be increased almost indefinitely owing to the unusually convenient situation for mining.

The slates which form this ore are intersected by a small stream which flows downward through Strickhouser's Ravine. These slates stand almost vertical and form a hill some 90 feet high, which enables the workmen to mine by open cut above water level, or shaft and drift on the vein, with the minimum amount of timbering.

About 12 to 25 miners are employed at this work, the number varying with the demand for the ore. No machinery is necessary as the ore is mined in an open cut above water level. On the surface there is stripping about 10 feet thick. The ore is transported in cars three-fourths of a mile to the Hanover Branch railroad, over the company's own sidings, down an incline of 75 feet in height. It costs, at present, fifty cents to transport an eight wheel car back to the mine. The only hauling necessary is that of the cars to the mine and some minor work about the cut.*

The following three partial analyses are extracted from Prof. Lesley's report on this property to Messrs. Musselman & Watts:

		Per cent.
The soft ore gave	Sulphur, - - -	0.007
	Metallic iron, - -	39.280
The hard ore	Sulphur, - - -	0.005
	Metallic iron, - -	26.650

A specimen from a different outcrop gave:

Silica, - - - - - - -	47.500
Alumina, - - - - - - -	8.650

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* The discussion in regard to the so called "Silicon Steel" which is not even yet entirely closed, was brought up by the claims made for this ore.—The whole subject is too familiar to experts to need repetition here

	Per cent.
Magnesia,	trace.
Per(?)oxide of iron,	37.150
Metallic iron,	26.000

Still another specimen gave:

Silica,	34.100
Metallic iron,	46.130
Phosphorus,	0.220

The residue, after crushing and separating with a magnet, showed:

	Per cent.
Silica,	1.800
Lime,	0.850
Alumina,	0.330
Manganese oxide,	0.220
Titanic oxide,	0.140
Chromic oxide,	0.130
Phosphoric acid,	0.080
	3.550

Still another analysis, kindly furnished by Mr. E. Mickley, of Hokendauqua, gave for the "white ore:"

	Per cent
Metallic iron, 33.4; or, if all magnetic,	46.100
Sulphur,	none
Phosphorus,	1.258
Silica,	15.000
Alumina,	16.000
	78.358
Undetermined,	21.642
Total,	100.000

A record of determinations of the silicious matter, iron and phosphorus in the Codorus ore made before the organization of the survey has been kindly sent to me by Mr. A. S. M'Creath, and is as follows:

	Silicious matter.	Iron.	Phosphorus.
Jan. 8, 1873,	32.400	33.200	0.452
July 16, 1873,	——	34.250	0.491
July 22, 1873,	——	34.800	0.229
Oct. 18, 1873,	——	35.250	0.340

Average composition in this determination:

	Per cent.
Silicious matter,	32.400
Metallic iron,	34.375
Phosphorus,	0.378
Sum,	67.153
Undetermined,	32.847
Total,	100.000

An average lot of samples were collected and forwarded to Mr. M'Creath for analysis of which the following is a tabular statement:

	Per cent.
Ferrous oxide,	0.900
Ferric oxide,	50.857
Manganese sesquioxide,	0.103
Alumina,	1.630
Lime,	0.862
Magnesia,	0.303
Sulphuric acid,	0.011
Phosphoric acid,	0.513
Water,	1.690
Insoluble residue,	43.425
Sum,	100.294
Excess,	0.294

This corresponds to:

Metallic iron,	36.300
Metallic manganese,	0.071
Phosphorus,	0.224
Sulphur,	0.004

Ignited Insoluble Residue.

Silica,	36.990
Ferrous oxide,	1.310
Alumina,	4.090
Lime,	0.050
Magnesia,	0.510
	42.950
Insoluble in hydrochloric acid,	0.917
Total iron,	37.217

45. *Jacob Sheaffer's Pit.* (*IV, 50.*)

Situated about one-half mile south of the York Iron Company's mine.

Opened seven years ago, and leased to A. H. Musselman. About 350 tons of limonite have been extracted. The pit is now abandoned and the ore is said to have entirely run out.

46. *Thomas Iron Company, Old Pit.* (*IV, 51.*)

Situated about 1,700 feet south-west of Sheaffer's.

It is now filled up. It was opened five years ago and wrought for a year. Now abandoned. The survey is indebted to Mr. E. Miekley, of the Thomas Iron Company, for an analysis of an ore from the Thomas Iron Company's farm, (exact place not specified,) which belongs here.

	Per cent.
Metallic iron,	36.000
Sulphur,	none
Phosphorus,	0.537
Silica,	15.500
Alumina,	22.000
Sum,	74.037
Oxygen, organic matter, water and loss,	25.963
Total,	100.000

47. *Thomas Iron Company's Bank, No. 2.* (*IV, 52.*)

This operation which consists of two banks and one shaft, lies about 2,700 feet south-east of No. 1.

They were opened about five years ago, and worked off and on since then, but are about to be abandoned, and the machinery removed to Smyser's station.

The shaft is about thirty feet deep, and one engine of 20-horse power was standing. Fifteen to twenty men had been employed at $1 25 per day, with a foreman at $40 per month, who also acted as engineer. The foreman contracted to haul all the ore to the siding, distant one-fourth of a mile, on the Hanover Branch railroad, at 27 cents per ton. The washer has ninety-five blades. No ore being taken out at present. Layers of mica slate occur between the ore deposits. Dip about north 45° west; inclination 45° to vertical.

48. *Thomas Iron Company's Bank, No. 3.* (*IV, 53.*)

This bank is partially washed in and contains water. It is at present abandoned. Besides this there are some small shallow pits along a line south 30° west extending some 100 feet. The outcrops of altered mica slates, a quarter of a mile south by west of these exploitation pits, show a dip of north 25° west; 75°.

An analysis of a "poor specimen" from Schmiech's farm adjoining the Thomas Iron Company's farm obtained from Mr. E. Mickley, was as follows:

	Per cent.
Metallic iron,	14.000
Sulphur,	0.450
Phosphorus,	2.149
Silica,	42.000
Alumina,	18.000
Sum,	76.599
Oxygen, organic matter, water and loss,	23.401
Total,	100.000

49. *E. G. Smyser's Bank.*

Opened by him five years ago. There is still ore remaining in situ in the bank, which latter, however, is not now being wrought. The bank which covers an area of over half an acre, and is about fifteen feet deep, is very much washed in.

50. *Hanover Branch Railroad Open Cut.*

Ore found when the railroad was first opened. Considerable quantity has been taken out. Not in operation.

51. *Emanuel Flickinger's Pits.* (*IX, 48.*)

Situated along the road just west of Jefferson. The ore was discovered two years ago, and the openings made in the winter of '73–'74. It was leased to the Messrs. Grove, of Danville, for ten years. No serious mining has yet been begun. The ore, as tested in a furnace, has been pronounced good, and the prospects fair for its existence in large quantities.

52. *Jesse Schumann's Pits.* (*IX, 49.*)

These have been sunk to depths of from 3 to 18 feet, and ore has been found. The mining right has been leased to Mr. Grove, of Danville, but nothing has been accomplished yet towards taking the ore out. Limestone occurs here at a depth of 17 feet, and a large quantity of blue clay, the result of the weathering of the crystalline schists, has been taken out.

53. *Mathew Myers' Ore.* (*IV, 58.*)

Area of pit, about one-third of an acre. It was opened about three years ago and wrought by Dr. Nes, but has been abandoned, and the excavations have since caved in. Eight hundred feet north of this bank an outcrop of sandy slates shows a strike of about north 60° east and vertical dip.

54. *Nes' Hill Ore.*

The hill lies a little south of east of Porter's Siding, Hanover Branch railroad. A number of small pits have been sunk. The material which has been taken out as ore resembles the slates of various localities previously mentioned. Small grains of magnetite, and occasionally some pyrites, are dissemminated through a mass of crystalline schists, more or less compact, sometimes chloritic and sometimes assuming a gneissoid appearance.

54*a*. *Forrey's Bank.* (*XVI, 60 and 61.*)

This bank lies a little less than quarter of a mile north-east of Smith's station, and at an elevation of about 114 feet above it. It lies about half a mile a little south of west of Nes' hill, and a short distance north of the Hanover Junction railroad.

The bank is over two hundred feet long north-east by south-west, and from 25 to 30 feet broad, and at present about 15 feet deep. It has been partly washed shut since the termination of mining operations, and the sides are in great measure covered with debris. At its south-west extremity is a shaft filled with water, and just beyond its north-east extremity another shaft, in both of which the ore appears to have been found, thus proving it continuous both laterally and under the surface on this property. About 700 to 800 tons were taken out of this bank in 1869, by Ruth & Phillips. The shaft or well in the south-west end of the shaft is reported, on Mr. Spangler's authority, to have been 70 feet deep, consisting of 10 feet of stripping and 60 feet through solid ore. The bottom of the shaft is said to be still in ore.

This bank was leased to Sprenkle, but the lease has now expired.

54*b*. *Stambach's Bank.* (*XVI, 60 and 61.*)

Situated on the same range, but 1,200 feet further south-west, and divided from the railroad by a narrow wall of earth, is a bank now fallen shut, about 200 feet long and 20 feet deep, narrowing from 50 feet broad at its lower extremity to a point at its upper limit.

Considerable quantity of earth has been excavated here and probably a great deal of ore taken out; its convenience to the railroad rendering it a profitable bank to work. It was opened by Ruth & Phillips in 1869, and worked during one summer, during which 700 to 800 tons were taken out and sent away. The pump and washer were worked by horse power, and the ore was taken out in carts. The washer was an ordinary single cutter. The supply of water was deficient, for which reason the washer was only used for half a day. The ore was sold for $3 00 to $3 50, on the cars. While the ore was cold short, it is represented not to have been as much so as some other banks on this range, but *which* banks are not specified.

54*c*. *Trone's Shafts.* (*XVI, 60.*)

These pits, which appear to have been sunk principally for purposes of exploitation, lie in a field about 1,000 feet north-west of Smith's station. They are at present nearly filled up, but the material which has been thrown out, and part of which remains, gives abundant evidence that ore was found. This deposit lies in the general course of the range indicated by the banks now under consideration.

54*d*. *Rudesill's Bank.* (*XVI, 65, 66.*)

This bank is situated three-quarters of a mile north-east and about ten feet lower than Smith's station, Hanover Junction railroad. The opening is about 300 feet west of the road in a field, and is 300 feet long, (east 12° north and west 12°

south,) 100 feet wide and at present about 20 feet deep. The entrance for carts is on its eastern side. The sides are much washed in, and the bank is partly filled with water, with some ore lying on the bottom uncovered and also in the vicinity of the opening. The ore does not differ in appearance from that of the other banks along this range, being a limonite mixed with clay.

There are no works now standing in the neighborhood of the bank, and the lease on it has expired.

54*e*. *Mickley's Bank.* (*XVI, 67, 68.*)

This large bank lies less than one-third of a mile a little south of east of the preceding. It is an open cut in the side of a hill, and at present perhaps 40 feet deep from the level of the ground on the north side and 30 feet deep on the south side, though partly filled with water. It averages about 200 feet in length and 150 feet in width, and covers about three-quarters of an acre. The engine house and pump pipes are still standing, and the machinery seems to be in good condition. Near the south-west end of the bank is a shaft and a considerable pile of ore is still left in the vicinity. The ore is a limonite mixed with clay.

54*f*. *Eckert & Kauffman's Bank.* (*XVI, 53 and 55.*)

This very large bank is situated about three-quarters of a mile north-west of Smith's station and one-half mile south-east of York Road station, Hanover Junction railroad. The bank is, however, provided with a siding for itself, and when in operation, the cars are run directly from the washer on to the Hanover Junction railroad.

This bank was opened in the spring of 1869, by Brooks, Ruth & Phillips, who leased it from Bollinger, but is now Eckert & Kauffman's mine.

There have been taken out from 28,000 to 29,000 tons of ore, to carry which twenty or thirty cars were employed. The engine of 30-horse power, worked a steam pump No. 10. There has always been water enough at the mine until last fall, when it got slack, and work was suspended. About 25 tons per day were got out. The wages paid were seven and one-half cents per car. At first, the wages were $1 25 per day, but in the summer of 1874, they had been reduced to 90 cents.

This ore was taken to Eckert's furnace, Brooks', Leesport Iron Company and William M. Kauffman; some was also sold. The ore is not rich but works easily in the furnace, (about 45.5 per cent. metallic iron.) It is cold short but devoid of sulphur and not sandy. The excavation is 40 feet in the deepest place. The freight to Reading *via* Columbia is $2 46 per ton, and more *via* Harrisburg.

There is still an abundance of ore in sight, lying in yellow and brown clay, with many clay partings. Thickness of stripping from 0 to 12 feet. The price of this ore was $3, delivered on the cars. The washer was an ordinary single bladed machine. Besides this bank, this company owned Josiah Moul's, Bollinger's and Miller's.

At the west end and in the south face of Eckert & Kauffman's bank, rock ore is exposed of a general thickness of about 30 feet, but separated by clay partings into plates of a few feet in thickness, which have the general appearance of *veins*, as all these deposits are termed by the miners. The average dip of a group of these superposed plates is south 32° east, 50°, but this will not represent the average dip of the formation whose strike in this vicinity is well exhibited, both by the general direction of the chain of banks and shafts, and even by the longer axis of each of the single excavations.

The general direction is more nearly east 10° to 15° north. These slight rolls, at least in this special region, probably correspond to flexures of the original beds before they were converted by weathering into the clay beds in which the segregation took place and prove that the disintegration of the calcareous, chloritic and hydromica slates which were subject to these destroying influences, proceeded very slowly and with little disturbance, the primitive surfaces of the folds being converted into clay so quietly as not to destroy the interspaces by agglutination. And either, that the solutions of iron found their natural course between the strata as would have been the case had no such alteration taken place; or, (which seems more probable, in these cases, and is the explanation offered by Prof. Shepard & Dr. Hunt,) that the production of these ores was a change in situ of the pyrites and other iron compounds deposited coincidently with the formation of the the schists in which they lie.

Hartman's Opening. (*XVI, 55.*)

At the eastern extremity of Eckert & Kauffman's, and divided from it by a fence, is an opening of Hartman, about 75 feet long, and from 10 to 25 feet wide. It is to a great extent filled up and shows no ore, but evidently was a bank of the same general character as its larger neighbor, and should be considered as an appendage to the latter.

54*g*. *Stover's Opening.* (*XVI, 55.*)

This excavation lies close to the railroad and about 600 feet north-west of a trial shaft at the western extremity of Eckert & Kauffman's bank. The bank was opened and leased to the Thomas Iron Company, but not much developed, owing to differences between lessor and lessee respecting the amount of royalty which should be paid. Its position, and the fact that the ore was proved satisfactorily, (as attested by Mr. Baumann,) together prove the average thickness of this deposit to be at least 383 feet, and probably in other places much more.

An ore from Stover's Mine, near Smith's Station, Hanover Branch railroad (not on the general map) furnished by Mr. Mickley, shows:

	Per cent.
Metallic iron, - - - - - -	31.500
Sulphur, - - - - - - -	none
Phosphorus, - - - - - -	0.591
Silica, - - - - - - -	20.000
Alumina, - - - - - - -	29.000
Sum, - - - - - - -	81.091
Oxygen, organic matter, water and loss,	18.909
Total, - - - - - -	100.000

54*h* *Sprenkels' Bank.*

Situated 800 feet south-west of Stover's, on the farm of Henry L. Baumann, at the York Road Station, Hanover Junction railroad. The opening covers perhaps half an acre.

Mr. Sprenkel opened in the spring of 1874 and took out 700 or 800 tons, none of which was hauled away from the bank. The financial depression and its effect on the iron market caused him to suspend operations since that time. A number of trial shafts sunk in a line about east 10° north, proved ore. On this same range are the Thomas Iron Company's lease, which is the next operation described, bearing west 10° south, and distant about 150 yards. Further on this range, or about 500 yards west 11° south, ore shafts were sunk on the Widow Forrey's place, all of which proved well. The machinery, engine house, washer, &c., of Sprenkel's opening are still standing and in good condition.

54*i*. *Kraber & Nes's Bank.* (*XVI, 49.*)

Situated on Mr. Henry L. Baumann's farm, and lies 500 feet south-west of Sprenkel's. The opening is about two-thirds of an acre in extent.

It was leased by Ness & Kraber in 1868–69, who took out perhaps 1,000 tons of ore, but the amount was not accurately ascertained. It was afterwards leased to the Thomas Iron Company in the following year. It was provided with a steam pump, and the ore was hauled out by six or seven carts. The Thomas Iron Company ceased working it in the following spring. During their occupancy (1870) they took out a great deal of ore—from 10 to 30 tons per day. The terms of the lease with Kraber & Nes required the lessees to pay $1 00 per ton royalty for the ore. The sub-lessees tried to compromise this royalty with Mr. Baumann for 50 cents per ton, and failing to come to an agreement withdrew their machinery.

The latter is closed from the action of the rains on its banks but still shows ore in place.

55. *John Baumann's Pit.* (*IX, 89.*)

Lies about a mile south-east of Hanover. It was originally opened about one hundred years ago, and reopened fifteen years ago by Vaningham & Case. It was afterwards leased to the Wrightsville Iron Company, but this lease also has expired. About 1,000 tons have been taken out by the last lessees. Washed shut.

56. *Flickinger's Bank.*

Situated 300 feet west of Baumann's. Was opened a few years ago, and leased to Mr. Small. At present is not leased.

Four or five hundred tons of ore have been taken out.

57. *Louis Delone's Bank.* (*IX, 90.*)

Situated about one mile south by east of the centre of Hanover, and a quarter of a mile west of the Baltimore turnpike.

It was opened in 1867 by Nes & Kraber, lessees for forty years. It was actively wrought about six months. 2,000 tons of ore have been taken out.

An analysis of this ore, kindly furnished by Mr. Mickley, of the Thomas iron company, shows:

	Per cent.
Metallic iron,	33.500
Sulphur,	none
Phosphorus,	1.470
Silica,	23.000
Alumina,	27.300
(Oxygen, organic matter and water?) loss,	14.730
Total,	100.000

The ore lies in large and small lumps in the clay formed from the decomposed slates.

There is little stripping necessary to reach the ore, of which a large body is visible in the north-east heading.

Two further analyses of the ore from this bank, made from specimens selected by Mr. Benade, have been furnished me by that gentleman:

	Booth & Garrett. Per cent.	Dr. F. A. Genth. Per cent.
Silicious matter,	11.500*	——
Silica,	[8.200]	7.550
Ferric oxide,	70.090	65.610
Alumina,	0.960	2.050
Manganese sesquioxide,	1.750	7.290
Phosphoric acid,	2.546	3.050
Sulphur,	0.033	——
Water,	13.150	13.880

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*Silicious matter contains 8.20 per cent. of silica, with a little alumina, ferrous oxide, lime and magnesia.

	Booth & Garrett. Per cent.	Dr. F. A. Genth. Per cent.
Magnesia, . . .	——	0.350
Cobaltic oxide, . .	——	0.220
Sum, . . .	100.029	100.000
Metallic iron, . .	49.060	45.930
Metallic manganese, .	1.210	5.070
Phosphorus, . .	1.110	1.330

58. *A. M. Forney's Bank.*

Situated 400 yards west of Delone's; was opened about ten years ago and leased to Green, Van Hernan & Co. 3,000 to 4,000 tons had been taken out when the lease was sold to the Wrightsville Iron Company, which worked the bank for five or six years, and took out 500 or 600 tons of ore.

Since then it has been given up. The excavation (partially washed shut, but with a considerable amount of ore showing in the eastern end) is about 200 feet long and 20 feet deep.

In this bank, as in that just mentioned, lumps of ore lie in clay.

59. *Samuel Schwartz's Opening.*

Situated about two miles south-west of Hanover and just south of the Littlestown road, in Conewago township, Adams county. It was opened in March, 1874, by Eckert & Bros., of Reading, lessees, and leased by them for fifteen years. After a thousand tons or more had been extracted the ore ran out and the bank was abandoned. The ore was used at the Henry Clay furnace. The machinery, which is costly and perfect, is yet standing.

The ore lies in crystalline slates, which dip about south 45°. The ore occurs with comparative regularity in the lines of lamination, and also in irregular shaped masses running into the normal mica slates which carry it. Some ore is still seen in the south heading.

60. *Solomon Schwartz's bank.* (*IX, 95; VII, 27.*)

Situated in the middle of the road, about three-fourths of a mile south-west of Samuel Schwartz's, (Eckert & Co.'s).

NOTE.—Mr. Benade states that the samples from which the two last analyses were made were the same.

It is a large irregular excavation, whose area covers perhaps an acre, and is at present from 30 to 40 feet deep. It was opened about nineteen years ago, and was leased two years ago to J. C. Duttenhoefer, who took out about 2,000 tons.

There is, at present, no lease on the property. The ore is said, by Mr. Schwartz, to exist in large quantities at the bottom of the bank. The clay constituting the walls is full of wash ore.

61. *David Boyer's Bank.* (*IX, 98; VII, 26.*)

Situated on the line of the Hanover and Littlestown railroad, about three miles north-east of Littlestown.

The property was leased 18 years ago by Bryan and Longenacker of Lancaster, who worked the bank for about two years, and afterwards sold it to Mr. M'Cormick, of Harrisburg, who afterwards leased it to other parties. It has lain idle for about a year, though the machinery has not been removed.

The bank covers an area of about three-fourths of an acre, is 15 feet deep, and partly filled with water. Banks are in soil and clay, showing some wash and lump ore—all limonite.

62. *Lefever's Pits.* (*X, 5.*)

Situated about one and a half miles south-east of Boyer's, and on the road from Hanover to Littlestown.

One shaft, at present about 20 feet deep, has been abandoned for some years, and is now partially filled up and caved in. Some smaller openings are also filled up. A sandy yellow ochre is found here, which is known as "mineral paint."

63. *Krumrein's Pits.* (*X, 4; VII, 27.*)

Situated on the south slope of a hill three-fourths of a mile south-west of Lefever's, and a little more south-east of Killinger's.

It was opened 4 years ago by Keeport and Yount, of Littlestown, and about 40 tons were sent away to the furnace. The ore is said, by Mr. Yount, to have produced 35 per cent. of metallic iron; but in the present condition of the openings, nothing is visible in the pile around the pit but a slate, somewhat resembling that of the Codorus ore, and more or less impregnated with iron oxide.

64. *Early & Killinger's Mine.* (*X, 7; VII, 25.*)

Situated about two and a half miles east by north of Littlestown, and just south of the Hanover and Littlestown road.

The above firm purchased about two years ago (Aug., 1874) from Levi Mouse, and their present workings have been in operation, off and on, ever since. The ore is a limonite, more or less pure.

An average sample, selected from various parts of the workings, and analyzed by Mr. M'Creath, in the laboratory of the Survey, at Harrisburg, showed:

	Per cent.
Insoluble residue,	12.320
Sesquioxide of iron, (Fe_2O_3)	67.000
Alumina,	0.950
Manganese sesquioxide,	2.341
Phosphoric acid,	2.804
Sulphuric acid,	0.277
Lime,	1.680
Magnesia,	0.591
Water,	11.890
Sum,	99.853
Loss,	0.147
Total,	100.000

There were therefore present:

Metallic iron,	46.900
Metallic manganese,	0.815
Sulphur,	0.110
Phosphorus,	1.224

The insoluble silicious residue gave on analysis:

Silica,	11.170
Oxide of iron,	0.010
Alumina,	0.610
Lime,	0.070
Magnesia,	0.120
	11.980
Silicious residue,	12.320
Determined,	11.980
Undetermined,	0.340

About twenty to thirty tons are taken out per diem, and there are employed, eight miners, one engineer, two cart boys and two men to rake out from the washer. The wages paid are $1 00 per day of 10 hours work. There is one 30 horse power engine, supplied by a 35 horse power boiler, which works a Smedley pump, supplying the washer directly from a reservoir, which is fed by a neighboring stream. The fuel used is bituminous coal, at $6 80, delivered at the mine. The consumption is about one-third ton per day.

Almost all of the ore is put through a double cutter, hundred bladed, Millholland washer, which is 26 feet long.

About one-third of the ore is lump. It is hauled to the washer by four carts and afterwards to Lefever station, Hanover, Littlestown and Frederick railroad, distant half mile, at a cost of 14 cents per ton, (the teams being owned by the company,) and shipped to the Keystone Furnace Company of Reading, which uses it. Two thousand tons have been sold to Watts of Marietta. It is taken out both by cart and inclined railroad.

The product thus far has been foundry iron.

The ore lies in beds in a very much disintegrated clay slate, partly indurated and exhibiting three planes of cleavage. One of these planes is that in which the ore itself dips south 15° west, 14°. An outcrop of ore and limestone occurs in a cut 200 feet west of the farm.

This limestone is said also to be galeniferous (or lead bearing.) The dip is about south 36° east, 25°, but the exposures are poor and this determination not certain. The strike appears to be about north 54° east.

65. *Enoch Lefever's Bank.* (*X, 8.*)

Situated about two miles a little north of east of Littlestown.

It is an opening 1,200 feet long in a north-east and southwest direction, and covers an area of about two and a half acres. The bank was first opened by George Bryan, about 19 years ago, who was at that time lessee. Afterwards it was leased to the Ashland Iron Company and wrought by them five or six years. Afterwards leased to Green Van Heiman & Company, and the Wrightsville Iron Company. It is at present under lease to Brooks & Company of Birdsboro', but has lain idle for three years. The machinery (engine, washer, &c.,) are still on the property. Some lump ore is exposed in the banks, but the ore is principally wash ore from the surface down. It is a cold short limonite, which is said to yield 50 per cent of iron (?)

66. *Widow Clark's Bank.* (*X, 10; VII, 24.*)

This property lies about one and a half miles east of Littlestown, on the "Commons" or unfenced fields. A number of openings have been made, but the works are not now in progress. The stripping is here, as everywhere on this line of ore, a yellow and white clay. There are two large banks about 1,000 feet apart. The northernmost bank was opened about six years ago, and the quality of ore taken out was said to be inferior to that from No. 2. This bank is shaped like the letter S and covers an area of over one-third of an acre. Bank No. 2 has an area of about 250 square feet, is partially filled with water and is approached by an inclined tunnel from the southward.

The banks have been leased by Boyer & Schwartz, but are not in operation at present, though the machinery is still on the ground.

The ore is a limonite of the shell-like character which is common to most of the ores in this range. About 1,200 feet north of No. 1 is the limestone quarry of Sol. Mehring, exhibiting a dip of south 35° east, 50°.

67. *Gohn Bank.* (*VI, 70.*)

This bank lies about two miles west of Wrightsville. It was opened 20 years ago by Mr. Henry Wilton, of Wrightsville, who had a lease for ten years. Mr. Wilton worked it for three years, when Messrs. Denny & Hess bought the lease and worked it for two years. At present it is not wrought nor under lease. Its owners are Jacob Gohn, John Gohn and Daniel Lehman.

The excavation is a little more than 400 feet long into the side of a hill, covers an area of about an acre, and is 25 feet deep at the western end.

The ore is a limonite like that of the rest of this range, and it was hauled to the tidewater canal for shipment.

Along with the sandy slates carrying this ore was a large vein of quartz.

68. *Benjamin Strickler's Bank.* (*VI, 68; V, 52.*)

Situated about two and a half miles a little south of west of Wrightsville.

This bank was opened twenty years ago by Mr. Bahn. It was then leased to Mr. Musselman, of Marietta, who worked it for several years. Mr. Haldeman then took the lease and worked the bank up to 1864, since which time nothing has been done except by the Wrightsville Iron Company, which sank a shaft at the mine about five years ago. Since this time the bank has been abandoned. It is now fallen shut and overgrown with trees and underbrush, and contains a considerable quantity of water. It covers an area of perhaps something over one-half an acre, and is thirty feet deep from the bank to the water's edge.

69. *The Stoner Bank.* (*VI, 66; V, 52.*)

Situated about three and a half miles a little south of west of Wrightsville.

An analysis of the ore obtained from Messrs. Watts, was as follows:

	Per cent.
Silica,	42.500
Peroxide of iron,	55.700
Alumina,	1.150
Lime and magnesia,	1.000
Sum,	100.350
Excess,	0.350

This corresponds to 38.99 per cent. of metallic iron.

Operations on this bank were commenced with an open cut in 1850. The amount of ore produced from 1850 to 1873, by Musselman & Watts, was 40,750 tons.

Shafts were sunk in the latter part of this period, which furnished a part of this amount. The bank has an area of about three-fourths of an acre, is 25 feet deep in its deepest place and partially filled with water.

70. *D. Rudy's Banks.* (*VI, 64, 65; V, 52.*)

Situated half a mile west of Stoner's, and about one-fourth of a mile north of the York turnpike.

Covers an area of about one and one-fourth acres, and is about 35 feet deep. The sides are washed in. The bank has been abandoned, and no information was obtained in regard to it. This bank was opened in 1862, by Musselman & Watts, and worked as an open cut. They took out 9,872 tons of ore up to 1870.

An analysis of the ore for its metallic iron furnished by Messrs. Watts, gave: Metallic iron, 41.160.

71. *Ruby's Ore Bank.* (*VI, 63; V, 52.*)

Situated about four and a half miles south of west of Wrightsville, close by the Glatz Ferry road.

It was opened 12 years ago and worked four years by James Meyers, of Columbia, as lessee. The bank is an open cut, 400 feet long, in an east by north direction, and varying in width, and covers an area of a little less than half an acre. The ore was used by Mr. James Myers, of Columbia. The bank has been idle for a number of years, and is much caved in. No ore is in sight in the trench, but a very large number of fragments of a hard quartzite.

Mr. Ruby himself reports the existence of magnetic ore in his large peach orchard.

72. *Keller's Ore Pit.* (*VI, 62.*)

Situated about one-half mile west by south of Ruby's is a pit of less than one-fourth of an acre in area, and about 10 feet to the water, which has been abandoned and is nearly filled up. The ore here was said to be exhausted.

No information was obtained regarding it, and its only value in this place is to illustrate the regularity of the line of banks from the river shore south-westward.

73. *Heistand's Ore Bank.* (*VI, 59; V, 52.*)

This very large bank lies directly on the Glatz Ferry road, about midway between York and Wrightsville.

It is of irregular shape, about 600 feet long, and covers an area of over two acres, and is from 18 to 20 feet deep. It is partially caved in and filled with water. The walls of the excavation are composed of clay and gravel. It was opened about ten years ago, and was worked by Musselman & Haldeman on two separate leases, but has been idle for three years past.

74. *Blessinger's Ore Bank.* (*VI, 56; V, 51.*)

Situated about one mile south of west of Heistand's is an open trench, in the direction of strike of this range, and 750 feet long, covering altogether an area of about three-fourths ot an acre.

It is abandoned and said to have been exhausted. Is much covered up. No rock in place, but fragments of sandstone and sandy slate constituting the debris.

Between the two last mentioned banks and close to the road a shaft has been sunk by Mr. Schall.

75. *Norse's Ore Bank.* (*VI, 55; V, 51.*)

Situated about one-half mile south-west of Blessinger's.

It is about 300 feet long, 25 feet deep, and covers an area of about two-thirds of an acre. The bank was opened by the New York mining company, and was wrought till about three years ago, since which time it has been abandoned.

76. *Miller's Bank.* (*VI, 55; V, 51.*)

Situated in the woods, about one-third of a mile west by south of Norse's. It is an irregular opening, occupying over one-third of an acre, and having an average depth of 15 feet. About 300 tons of ore have been extracted. No outcrop of rocks in place is visible, but the ground is strewn with sandstone and slate.

77. *Samuel Deitz's Bank, and*
78. *Jacob Deitz's Bank.*

These two banks are about a quarter of a mile apart on the same range. The former lies about half a mile south-west of Miller's. They were leased and opened by Mr. Stephen F. Eagle, of Marietta, about ten years ago. They have not been worked for six years. About 2,000 tons have been taken out by carts. This ore was shipped *via* Meyers' station, distant one mile, to Marietta, where it was used by Mr. Eagle in his own furnaces.

There are about eight feet of stripping overlying the ore. The latter lay in regular pockets and nests in white and yellow clay.

These banks are each about half an acre in area and about 20 feet deep. The ore was washed at the bank, but the supply of water was deficient.

78. *Fritz's Ore Bank.* (*VI, 55; V, 51.*)

Situated about three and a half miles north-east of York, on the property of Susannah Fritz, leased to Benson & Cottrell.

It was first opened nine years ago by Meyers & Benson, whose lease expired after five years. Benson & Cottrell have had the lease for four years, and have worked the bank until last June. They employed one 20-horse power engine and 18 men. The fuel was hard coal. The ore was principally wash ore, and was got out by means of an inclined plane, and carted to Meyers' station, York and Wrightsville railroad, and thence shipped to Marietta. The bank is partially filled with water. The ore is distributed in pockets and nests through blue clay, which formed much of the sides of the pit beneath the stripping. A large quantity of ore was visible in the north heading of the bank, reaching to very near the surface.

The bank is about 40 feet deep.

A large number of specimens were selected as samples. An analysis was made by by Mr. M'Creath, at the laboratory of the Survey in Harrisburg. The following is the result:

	Per cent.
Insoluble residue,	19.750
Sesquioxide of iron,	63.285
Alumina,	0.765
Manganese sesquioxide,	2.210
Phosphoric acid,	2.986
Sulphuric acid,	0.068
Lime,	0.196
Magnesia,	0.216
Water,	10.880
Sum,	100.356
Excess over 100 per cent.	0.356

This corresponds to—

	Per cent.
Metallic iron,	44.300
Metallic manganese,	1.540
Sulphur,	0.024
Phosphorus,	1.303
The insoluble residue gave:	
Silica,	15.250
Oxide of iron,	0.170
Alumina,	3.230
Lime,	0.040
Magnesia,	0.630
Sum,	19.320
Insoluble residue,	19.750
Loss,	0.430

80. *Heidelbach's Bank.* (*VI, 48; V, 51.*)

This small bank lies about two and one-fourth miles north-east of York.

It was originally opened by Myers, who leased it for one year. It was then taken by Mr. Philip Small, who worked it until the ore was exhausted, about six years ago. About 600 tons were taken out by carts, from three to seven hands being employed. The area of the bank is a little less than half an acre, and the depth at present about ten feet. At this bank a compact quartzite crosses the road, dipping north-west, 60°. The debris show nothing but sandy slates.

81. *The Ebert Banks.* (*VI, 46; V, 50.*)

Situated about one and three-quarter miles north of York.

The most northerly is sometimes called the Corr bank. They were bought by Benson & Cottrell eight years ago, and have been in operation ever since until October, 1873.

The ore is principally wash ore. About ten tons were extracted per diem, by means of an inclined railroad.

Eight men were employed at an average of $1 25 per day. The engine was of 14 horse power and consumed 600 lbs. to 700 lbs. of hard coal per day.

The ore was shipped to Myers' station, on the York and Wrightsville railroad. They are not at present in operation, and are partially filled with water. The Corr bank covers an area of about three-fourths of an acre, and the Ebert of upwards of one and a half acres. The latter is about 30 feet deep.

In the Corr bank there is an interesting exhibition of a hard compact quartzite, dipping north 15° west 30°, and cutting out the ore along the line of a fault (?) The slates are much contorted and show a cleavage dip of south-east 70°.

82. *Daniel Louck's Banks.* (*VI, 42; V, 50.*)

These are two banks on the property of Daniel Louck, about one and one-fourth miles north-east of York, leased by Benson & Cottrell.

The banks are about 100 feet apart, with a smaller pit between them. They were opened about seven years ago. They employ four hands and an eight horse power engine. The ore is principally wash ore, with some lump. Carted to Meyer's station, York and Wrightsville railroad. Only about three-fourths as much water as was needed was obtained from a well 40 feet deep. The ore is brought out of the banks by means of carts. The washer was a Carter washer. The north bank covers an area of over one-third of an acre, and is 20 feet deep. The most southerly of over half an acre, and is 25 feet deep, with the south-east bank almost vertical.

The rocks in which this bank is cut are crystalline schists, much intersected with veins of quartz.

83. *Jacob Eisenhart's Ore outcrop.* (*III, 33.*)

In the vicinity of Eisenhart's farm, on the Gettysburg turnpike, and about two miles from York, is to be found an extensive occurrence of wash ore, consisting in great part of anhydrous oxide of iron. This ore lies in many places on the properties of Mr. Eisenhart and in the fields back of Mr. Winter's blacksmith shop. Mr. Eisenhart has sunk a few exploitation pits, but nothing is showing which will prove the existence of a large deposit. Not far from this property and near the fork of the Carlisle road, and that to Emig's mill, on the property of J. Buhn, is found an old pit dug long ago, and now filled up, which was said to have shown magnetic ore. From the waste around the mouth of this pit, a large specimen of magnetic limonite was found. The relation of these ores to the trap dykes is worthy of investigation, more especially since the direction of the Beeler trap is towards bank No. 84, which also exhibits exceptional magnetic properties.

84. *Old Kauffman Bank.* (*I, 80.*)

A little less than three miles south-west by west of York, is a bank formerly worked by Mr. Kauffman, who took out some 500 tons of ore. This ore is magnetic, so much so indeed, that the dip needle showed its greatest declination here. The record of the number of degrees of the south dip as before explained is valueless, because the instrument was not in adjustment, but that the relative amount of the dip was greater here than elsewhere, is established with a great degree of probability.

The ore from this mine lay in scales along with mottled red and blue limestones, and was for the most part anhydrous. A mass of ore in places showed a dip of south 10° east 25°. The slates associated with this ore seemed to dip south 10° east 70°.

85. *M. Eyester's Bank*, (*Smyser's & Brillinger's.*) (*IV, 23; II, 11.*)

This is a trench of about 350 feet in length and 20 feet average depth; evidently not used for a long time. The bank has almost entirely been washed shut and is overgrown. The fine grained mica slates carrying the ore dip south 20° east, 64°. The ore occurs in detached nests and lumps of brown and red hematite. No magnetite is visible with the glass. The slates have almost entirely weathered into white clay, in most places exhibiting streaks of ferruginous clay. The slates, which still retain their lamination, are very rotten.

This bank is not in operation now and bears the appearance of having been abandoned for a number of years.

The northern end of the trench is cut through compact and fine-grained mica slates, while the southerly end is in decomposed slates and ferruginous clay carrying the limonite.

There are at least 100 feet, and probably more, of these soft beds over the harder slates, and it is in them that the ore is found.

86. *Samuel Emig's Bank.* (*IV, 26.*)

Situated three miles west by south of New Salem. This was opened about two years ago, and is leased to Mr. Watson.

About 600 feet west is an outcrop of limestone, with a strike of about north 32° east (?

87. *W. S. Johnsons Pit.* (*IV, 28.*)

Situated about three-quarters of a mile west of S. Emig's, and close to the settlement of Nashville. It was sunk about one year ago and ore was found.

88. *Andrew Mengis' Bank.* (*IV, 30.*)

This and a smaller excavation lie about one mile south of the last mentioned.

They were opened and leased by Watts & Sons, but have not been in operation for a year. The bank covers an area of about one and a quarter acres, and is of irregular shape.

The Survey is indebted to Mr. Watts for the following additional statistics in regard to the "Mengis' Ore Bank:"

It was opened in 1872, by Bahn & Stoner, and afterwards purchased by Henry M. Watts & Sons.

The total amount of ore thus far produced is 3,772 tons.

An analysis of the ore gave—

	Per cent.
Metallic iron,	39.640
Insoluble silicious residue,	37.800
Sulphur,	trace
Phosphorus,	0.080
Sum,	77.620
Undetermined,	22.380
Total,	100.000

89. *Michael Meyer's Pits.* (*IV, 34; II, 15.*)

Situated a little less than a mile west of Mengis's. The exploitation was made a year ago, and the property was leased by Eckert & Brother. No serious mining operations have yet been begun.

90. *S. Roth's.* (*IV, 31.*)

Situated about one mile due north from the last A pit has been dug 15 feet deep one year ago, and ore was met. Nothing has been done to mine it.

91. *J. Roth's Bank.* (*IV, 32; II, 13.*)

This bank which covers perhaps half an acre, lies about three quarters of a mile south by west of S. Roth's. The bank is partly an open cut against a bank of clay, and at the northern end filled with water. The banks are 20 feet high, and composed of clay, with about seven feet of stripping. The slates pass into stained clay on one side and ferruginous slate or impure ore on the other. Under the foundations of Mr. Roth's barn there is said to have been found a massive bed of limonite.

92. *J. L. Miller's Pit.* (*IV, 33.*)

Situated about three-fourths of a mile south-west of J. Roth's. The pit has been disused for four years, and the banks washed shut by the action of the rain. About 1,000 feet south of this opening is a sandstone outcrop, dipping south 45° east 40°.

93. *Geo. Bechtel's Ore Pit.* (*IV, 37.*)

This is an irregular pit, covering perhaps half an acre, which lies about one and three quarter miles south-west of Michael Myers, and on the same road. It has been leased by Watts & Musselman, and was opened six or seven years ago. It has not been in operation since last fall.

The eight banks last referred to are disposed around one of the southern spurs of the Pigeon hills, and mark its outline with tolerable precision.

94. *J. & D. Bollinger's Bank.*

Situated about four and a half miles north-east of Hanover, and about one and a half from the Hanover Branch railroad.

This extensive bank is one of the most important in York county. It was leased by the Leesport iron company, and opened one year ago, and has been worked constantly ever since. Sixteen hands are employed, including a foreman. Eight miners in the bank, divided into two gangs. Each gang receives seven and a half cents per car load of ore sent up, and there are 120 car loads taken out of the bank per day. (This amounts to $1 12 per hand per day.) The foreman receives

$38 per month. The engineer and other outside hands $1 00 per day. The engine is of 55 horse power. There is enough water. The ore is hauled to Kauffman's siding, Hanover Branch railroad, two and a half miles from the bank.

About 90 per cent is wash ore, and is washed in a washer of 104 paddles.

The ore lies in irregular lumps and nests in a clay formed from the disintegration of the mica slates. A large number of specimens were taken to form an average sample, and the analysis made by Mr. M'Creath, at the laboratory of the Survey in Harrisburg, gave the following results:

		Per cent.
Insoluble residue,		16.950
Sesquioxide of iron,		64.428
Alumina,		3.148
Manganese sesquioxide,		2.150
Phosphoric acid,		1.374
Sulphuric acid,		0.230
Lime,		0 140
Magnesia,		0.270
Water,		11.020
Sum,		99.710
Loss,		0.290
Total,		100.000
Herein contained were:		
Iron,		45.100
Manganese,		1 496
Sulphur,		0.090
Phosphorus,		0.601
In this insoluble residue were contained:		
Insoluble residue,		16.950
Silica,	14.370	
Oxide of iron,	0.210	
Alumina,	1.590	
Lime,	0.020	
Magnesia,	0.240	
		16.430
Undetermined,		0.520

94*a*. *Sprenkles' Shaft.* (XVI, 77–79.)

This bank, which is now being opened, lies one and one-third miles north 12° east of Bollinger's bank, and a little more than one-third mile east 13° north of Forrey's outcrop.

This ore property was opened by Mr. Benade for the Lochiel iron company, in the fall of 1874. The openings thus far consist of a number of rectangular shafts, sunk north of the Hanover and York Short Line railroad. One of these, about 400 feet from the railroad, is cribbed and sunk partly as an open cut to a depth of about 30 feet. North-west of this shaft (at which the engine house is in process of erection) is another shaft, also about 30 feet deep, which for convenience will be called the north-west shaft. Other smaller shafts have been sunk to small depths below the surface, in all of which ore has been proved. The ore in the shaft first mentioned is peculiar, both from its own character and the way in which it is associated with the rocks. In appearance it is a dull brick red ore, containing masses of specular and some micaceous ore, much mixed with sand and the slate gangue. The latter is a fine grained chloritic hydro-mica slate, in which thin seams of limestone are intercalated. Two veins are passed through by this shaft, the overlying one foot thick, and the lower unmeasured, but said to be thicker. A thin seam of slaty limestone overlies the larger and underlies the smaller ore bed.

The property belongs to Emanuel Sprenkle.

The ore from the north-west shaft is of different character, (to judge by the specimens thus far taken out,) and resembles more nearly the limonites of the other banks of this range. The prevailing dip is north-west, 50°; and the ore in the north-west shaft overlies that in shaft number one.

Further west, on the property of Benj. Hershey, Musselman sank, in 1867, an exploitation shaft in the orchard, 30 feet deep, and found a solid bed of ore. He offered $1 00 royalty for the privilege of starting a bank here, but Mr. Hershey refused to lease the property for that purpose.

About 500 feet north of shaft number one is a limestone quarry, at the junction of the slate and limestone. The dip of both at the south side of the quarry is north 35° west, 48°. The latter underlying the former.

95. *G. Forry Ore Outcrop.* (*V, 9; II, 23.*)

Situated five and a half miles north-east of Hanover, at the base of the Pigeon Hills. Mr. Forry reports striking a large mass of ore whilst ploughing in the orchard. A limestone on Forry's land dips south 55° east, 22°.

96. *Samuel Boyer's Bank.* (*V, 10.*)

This bank was opened twenty years ago, and was leased two years ago to Hess & Denny. It lies five and a quarter miles north north-east of Hanover. The bank is of oval shape, covering about half an acre, and has an engine house and inclined plane. North of this is a more irregular bank covering perhaps one and a half acres. Each of these is about 15 feet deep. The ore lies in irregular segregated masses in clays. There are no unaltered slates in the bank.

The character of the ore is shelly, friable and ochreous, mixed with much clay.

97. *The Ashland Iron Company's Banks.* (*V, 12; V, 33.*)

Situated close alongside that of J. Moul's, and can be best described with it. The larger one is full of water, which is 25 feet deep, and covers about one and a half acres. The bank was first opened about 100 years ago, and furnished ore for casting of cannon balls during the Revolution in a furnace in Maryland. It was leased by Ex-Gov. Porter from Moul. It has been worked pretty steadily in the last 20 years, and furnished about 400 tons per month; 60 per cent wash-ore.

98. *J. Moul's Bank.* (*V, 12; II, 31.*)

Situated about five miles north-east of Hanover. It was opened about 15 years ago by Johns & Moul, who worked it six months, and leased to Ruth & Phillips, who, in turn, leased half to Denny & Hess, and the other half to Kauffman, Eckert & Brooks, (Leesport Iron Company,) for eight years. They have worked it three or four years, and took out about 14 tons (180 to 185 car loads) per day. The ore is shipped to Kauffman's siding, Hanover Branch railroad, three miles distant, where it is worth $2 50 per ton, delivered At present no ore is being shipped. Inclined plane 200 feet; 100 paddle lump washer and sand washer; 35-horse power engine, consuming 1,100 pounds of coal. Sufficient water is procured. Nineteen men are employed, divided into three gangs. Some are paid by the day at $1 00, and some by the car load, at seven cents to seven and a half cents. Engineer, $33 per month; foreman, $40. Eleven working hours. About 400 tons per month are taken out. Two 35-horse power boilers and five cars are employed. The workmen who are paid by the load make about $1 50 per day. The waste water is cleared from the mine by a drain into a sump whence it is pumped out to the washer, and what is not used for washing is discharged into the creek. About 12 tons per day are washed.

The transportation to the shipping station costs 60 cents per ton, and is performed by contract, the wagons not belonging to the company. The washer is 24 feet long and 18 inches in diameter. Nine men are constantly employed in mining.

The stripping is nine feet thick, after which comes a thick layer of white clay and gravel, and below this the yellow clay carrying the ore. It is uncertain how much deeper this clay continues.

99. *Solomon Moul's Bank.* (*V, 13.*)

Situated four and a half miles north north-east of Hanover, covers an area of about two and a half acres, and is fifteen feet deep.

The engine house stands at the north end of the bank; below the stripping the walls are cut in tenacious clay. The bank was opened twenty years ago by Gov. Porter, but is at present idle.

100. *P. Moul's Banks.* (*V, 14.*)

These are two small banks and a few shafts, four and a half miles north-east of Hanover.

It was leased to P. Small, who took out 200 tons or more. The lease is now out. The shaft is twenty feet deep; not in operation at present.

101. *Bechtel's Banks.* (*V, 15.*)

These are, first a large irregular opening, covering nearly four acres and lying about three and three-fourth miles north north-east of Hanover; and secondly, a bank of an area of one-fourth acre lying a quarter of a mile north of this. Neither of these are being wrought at present, but the occurrence of the ore resembles that in the Haldeman bank. No exposures were observed in the vicinity

102. *E. Haldeman & Co.'s Bank.* (*V, 15.*)

The distance and direction of this bank from Hanover are the same as of the last. This bank lies perhaps 100 feet from the western extremity of Bechtel's.

It was opened in 1870, by J. Duttenhœfer, of Hanover, and is now worked by E. Haldeman & Co. There are eight feet of stripping before reaching the ore. There are three cars at work, which are intended to put out thirty tons of ore per day. The bank covers perhaps one-half acre. Eighteen men are employed eleven hours per day, at $1 10, or nine to ten cents per car load of dirt and ore. The water supply is not sufficient. Sixty six per cent is wash ore.

He can wash 600 tons per month of 25 working days. But Mr. Haldeman has operated as yet with one car; 250 tons will work six cars.

The ore lies in yellow and blue clays. The deposits are irregular and frequently run out. They are from one to three feet in thickness

It is used at Chickies in small quantities, as admixture with Cornwall and Chestnut Hill ore, for foundry iron.

Twenty-five tons of ore per day are shipped at Smith's Station, Hanover Branch railroad, two miles distant. The engine is 30-horse power.

The bank is now about 45 feet deep, and the only trouble is from the scarcity of water.

A plate of "red oxide" runs in a south-west direction from Haldeman's bank. It was discovered six feet from the surface and has been followed some distance towards Kauffman's

Specimens were selected from all parts of this bank and mixed together, and from this an average sample was selected and analyzed by Mr. M'Creath, with the following results:

	Per cent.
Insoluble silicious residue, . .	16.600
Sesquioxide of iron, . . .	61.428
Alumina, ...	3.176

	Per cent.
Manganese sesquioxide,	5.570
Phosphoric acid,	1.540
Sulphuric acid,	0.236
Lime,	0.157
Magnesia,	0.155
Water,	11.010
Sum,	99.878
Loss,	0.128
Total,	100.000

This analysis corresponds to

Metallic iron,	43.000
Metallic manganese,	3.878
Sulphur,	0.094
Phosphorus,	0.672

The insoluble residue was composed as follows:

	Per cent.	Per cent.
Insoluble residue,	16.60	
Silica,		14.240
Oxide of iron,		0.310
Alumina,		1.570
Lime,		0.010
Magnesia,		0.140
Sum,		16.270
Undetermined,		0.330
Total,		16.600

An analysis of this ore, made January 30, 1874, by J. Blodget Britton, gave—

	Per cent.
Metallic iron,	44.91
Insoluble silicious matter,	18.98
Phosphorus,	1.30*

The external characteristics of the ore spoken of above, were those of a sandy limonite full of seams of ochre, and containing göthite and other oxides of iron.

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*It seems hardly possible that so great a difference in the amountof phosphorus in carefully selected samples should exist. Perhaps Mr. Britton intended the 1.30 per cent. to refer to phosphoric acid, and not to phosphorus.

The so-called Red oxide, which is highly valued as an ore, occurs both here and at several other points in the county. It was sampled and analyzed by Mr. M'Creath, with the following result:

	Per cent.
Insoluble silicious residue,	19.090
Sesquioxide of iron,	72.143
Alumina,	1.725
Manganese sesquioxide,	0.387
Phosphoric acid,	0.432
Sulphuric acid,	0.123
Lime,	0.168
Magnesia,	0.330
Water,	5.760
Sum,	100.158
Excess,	0.158

This analysis corresponds to

	Per cent.
Metallic iron,	50.500
Metallic manganese,	0.269
Sulphur,	0.049
Phosphorus,	0.189

Physically this mineral is exceedingly tough and hard, and also somewhat arenaceous.

The analysis of the insoluble residue, was as follows:

	Per cent.	Per cent.
Insoluble silicious residue,	19.090	
Silica,		16.160
Oxide of iron,		0.720
Alumina,		1.780
Lime,		0.050
Magnesia,		0.250
Sum,	18.960	18.960
Undetermined,	.130	

103. *Kaufman's Bank.* (*V, 16.*)

Situated alongside of Miller's, which is next on this list.

It was being opened and the machinery was being put in position. Up to September 15 the bank was not fairly in operation, and can best be described by its neighbor. The machinery is to be of the first quality, and this bank will soon doubtless stand in the first rank of York county banks as to production.

104. *Ashland Company's Bank.* (*V, 16; II, 37.*)

Leased from Mrs. Miller. This very large bank, which is but 400 feet west of Kauffman's, lies three miles north north-east of Hanover, at the base of the Pigeon Hills.

It was opened about 1863. It covers about three and one-fourth acres. Fifteen men are employed in this bank, and about 18 tons are procured per day by carts and without a plane. The whole clay bank below the stripping pays to wash. The ore is shipped to York Road switch, three miles distant. There is in use one portable engine of six horse power. The supply of water is usually sufficient, but when this is not the case the water is allowed to run back from the mud dams. The hands are paid 10 cents per hour for 11 hours work. The engineer gets $35 00 per month.

Seventy-five per cent of the ore is wash ore. The engine is of eight horse power and the consumption of anthracite coal about 10 tons per month. The washer is 26 feet long, with 96 paddles, arranged as single cutter, 14 inches in diameter, and makes 8 revolutions per minute, and the wash screen 13 per minute. Six one horse carts are employed.

The ore occurs in blue and yellow clays, in loose segregated masses. It is used as a mixture with Tremonium ores in the Ashland company's furnace. The capacity of the washer is greater than the production of the mine.

Thirty-one tons *have* been washed in a day, and 25 can easily be washed in the same time.

105. *Bauman's Bank.* (*V, 17.*)

Known also as Myer's bank. It lies about three miles a little north of east of Hanover. Opening about one-half an acre in area. It has not been in operation since fall of 1873

106. *Widow Miller's Bank.* (*V, 17.*)

This is a small pit, a few hundred feet west of Bauman's, and at present about 10 feet deep. Never much wrought.

107. *Ex-Gov. Porter's Bank.* (*V, 17.*)

This is a bank of about an acre in area, opened about 1840 by Gov. Porter. It is situated about three miles east of north of Hanover. It was wrought up to about 1862.

Besides this large bank there are a number of small pits in the vicinity. All are washed shut.

108. *Gitt's Bank.* (*V, 18; II, 38.*)

A number of pits have been sunk a little over three miles due north of Hanover, on the Abbottstown road, from which a considerable amount of ore seems to have been extracted. Not now in operation.

Country rock, quartzite and sandy slates.

109. *M'Conaughy's Opening.*

About three and a half miles north-west from Hanover, on the Hanover and Carlisle turnpike, Mr. Benade had just opened some exploitation pits for the Lochiel iron works of Harrisburg. Very little ore has as yet been taken out, but there are said to be fair indications for a limonite of good quality.

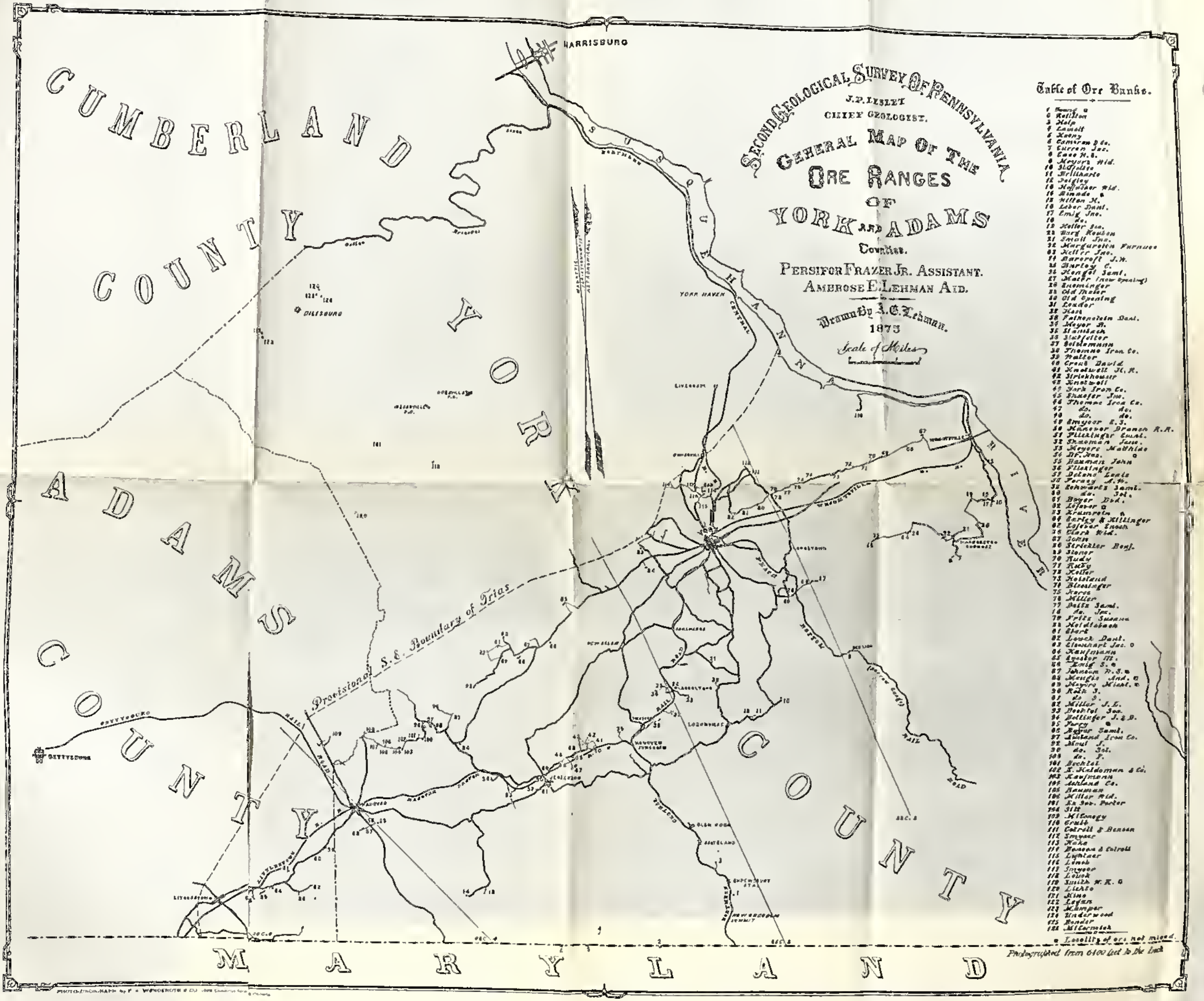
Country rock, quartzite.

110. *Grubb's Bank,* (*VI, 96; VII, 7.*)

Or the Codorus ore bank, on the Codorus furnace estate, lies five miles a little north of west of Wrightsville, and belongs to C. B. Grubb and heirs of E. B. Grubb.

It was discovered and opened in 1866. The ore is a sandstone impregnated with iron oxides, of which (by an analysis by Mr. J. B. Britton, kindly furnished by the Messrs. Grubb & Son) not more than one-third exists in the form of magnetic iron and the other two-thirds as red and brown hematite.

From 2,000 to 3,000 tons per annum are taken from this mine, at a cost of from 30 to 40 cents per ton. No machinery is required. The bank is an open cut of about three-fourths of an acre in extent and 25 feet deep in its eastern end. The carts are driven in at the west end, directly up to the east heading and there loaded with the "rock ore." The ore is hauled by contract about one mile to the Susquehanna river, for 50 cents per ton, and thence floated to the St. Charles furnace, above Columbia, for $1 00 per ton. There is no interference with operations from water.

SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA
J. P. LESLEY
CHIEF GEOLOGIST.
GENERAL MAP OF THE
ORE RANGES
OF
YORK AND ADAMS
Counties.
PERSIFOR FRAZER JR. ASSISTANT.
AMBROSE E. LEHMAN AID.
Drawn By A. E. Lehman.
1875
Scale of Miles
Table of Ore Banks.
1 Bound
2 Rolliton
3 Holp
4 Lamott
5 Keeny
6 Cameron & Co.
7 Curren Jas.
8 Case H. S.
9 Meyers Wid.
10 Stoffelts
11 Brillharts
12 Deigley
13 Hoffacker Wid.
14 Bonade
15 Hilton H.
16 Leber Danl.
17 Emig Jno.
18 do.
19 Keller Geo.
20 Burg Reuben
21 Small Jno.
22 Margaretta Furnace
23 Keller Jno.
24 Barcroft J. H.
25 Burley C.
26 Hengel Saml.
27 Maier (new Opening)
28 Ensminger
29 Old Maier
30 Old Opening
31 Leader
32 Hess
33 Fahnenstein Danl.
34 Meyer H.
35 Stambach
36 Stahlfelter
37 Seitzmann
38 Thomas Iron Co.
39 Walter
40 Crout David
41 Knotwell H. R.
42 Strickhouser
43 Knotwell
44 York Iron Co.
45 Shaefer Jno.
46 Thomas Iron Co.
47 do. do.
48 do. do.
49 Smyser E. S.
50 Hanover Branch R.R.
51 Flickinger Emal.
52 Shaeman Jase.
53 Meyers Mathilde
54 Dr. Nes.
55 Bauman John
56 Flickinger
57 Delone Louis
58 Forney A. H.
59 Schwartz Saml.
60 do. Jol.
61 Boyer Dnd.
62 Lefever
63 Krumrein
64 Gartley & Killinger
65 Lefever Enoch
66 Clark Wid.
67 Sohn
68 Strickler Benj.
69 Stoner
70 Rudy
71 Ruby
72 Keller
73 Holsland
74 Bleesinger
75 Hares
76 Miller
77 Deitz Saml.
78 do. Jac.
79 Fritz Susana
80 Heldtabach
81 Stark
82 Lauck Danl.
83 Ellenhart Jac.
84 Kaufmann
85 Lyster M.
86 Emig S.
87 Johnson P. S.
88 Meagle And.
89 Meyers Mial.
90 Roth J.
91 do. J.
92 Miller J. L.
93 Bechtel Geo.
94 Bolinger J. & D.
95 Forry
96 Boyer Saml.
97 Ashland Iron Co.
98 Moul J.
99 do. Sol.
100 do. P.
101 Bechtel
102 E. Haldeman & Co.
103 Kaufmann
104 Ashland Co.
105 Bauman
106 Miller Wid.
107 Ex Gov. Porter
108 Sitz
109 McConegy
110 Grubb
111 Cotrell & Benson
112 Smyser
113 Hake
114 Benson & Cotrell
115 Lightner
116 Leach
117 Smyser
118 Lauck
119 Smith W. K.
120 Lichte
121 Hine
122 Logan
123 Kemper
124 Underwood
125 Bender
126 McCormick
• Locality of ore not mined.
Photographed from 6400 feet to the inch
CUMBERLAND COUNTY
YORK COUNTY
ADAMS COUNTY
MARYLAND
HARRISBURG
SUSQUEHANNA RIVER
YORK HAVEN
CENTRAL
NORTHERN
DILLSBURG
GETTYSBURG
Provisional S. E. Boundary of Trias
WRIGHTSVILLE
HANOVER JUNCTION
GLEN ROCK
LITTLESTOWN
HANOVER
RAIL ROAD
SHREWSBURY STA.
NEW FREEDOM SUMMIT
PHOTO-LITHOGRAPH by F. A. WENDEROTH & CO.

There are about 18 feet of clay and soil above the rock, which is a gray gneissoid sandstone, containing impressions of cubes of limonite pseudomorphs and often pyrite. The sandstone plates are about two feet thick, more or less stained by iron oxides. The general dip is south 12°. About 15,000 tons ot the ore in all have been taken out.

In reference to the use of this ore the following extract from a letter of the firm is given: "The iron made by a mixture of this ore is soft, strong, and very fluid, which latter quality makes it valuable for foundry purposes. It is also an excellent mixture in a furnace—(low per cent of Phosphorus)—making Bessemer steel' iron; also for mixture with Cornwall ore. The Cornwall ore containing about 6 per cent alumina to about 15 per cent of silica, is deficient in silica to produce the best results in a furnace with economy of fuel, and the silica in this Codorus ore returns the amount required by a proper regulation of the burden. A furnace will make more iron with a better yield of ore, with less fuel, by the use of this ore in connection with Cornwall than any other. The ore is used by C. B. Grubb & Son, in the proportion of one-seventh in connection with Chestnut Hill and Cornwall ores. The iron made is considered equal to the best standard mill for plates, refined bars, nails and foundry purposes."

An analysis of the ore by J. Blodget Britton, was as follows:

		Per cent.
Water,		3.600
Iron protoxide,	4.130	40.310
Iron sequioxide,	36.080	
Oxygen,		17.160
Silica,		33.800
Alumina,		4.610
Lime,		0.050
Phosphorus,	0.069	0.158
Oxygen,	0.089	
Sum,		99.688
Loss,		0.312
Total,		100.000

According to this analysis there are 28.46 per cent of metallic iron in the ore.

At the time of the visit to this mine, about 25 tons were being taken out per day. The bank is only worked during the summer months. Seven men were employed there at $1 10 per day of 11 hours.

There is about eight feet of stripping to the clay, in which occurs wash ore for six or seven feet more, and then solid rock ore.

The dip at one exposure seemed to be about south 20° west; 20°.

111. *Cottrell & Benson's Bank.* (*VI, 41.*)

This (and the next described) banks lie about three and a half miles a little east of north of York. They are separated only by the width of the road, and of course are geologically identical. The description of the larger one will apply to both.

This bank is owned by Cottrell & Benson, and has been operated by them since 1871. The principal ore is a limonite, of which ten tons were got out per day. Twenty men were employed in the bank and eight outside. The engine of 20 horse power consumed about half a ton of coal per day. The ore (all wash ore) was hauled to Emigsville, two and a half miles distant, and shipped to Marietta. The bank is at present 45 feet deep, and the ore is raised by inclined planes. Its area is about one-half an acre.

It was not in operation early in September, 1874.

112. *Smyser's (Small's) Bank.* (*VI, 41; V, 49.*)

This large bank covering an area of about two and one-half acres, was leased by the Ashland iron company, ten years ago, and the lease has yet ten years to run. The ore exists as lump and wash ore and about fifteen tons are taken out per day.

Eighteen to twenty men are employed @ $1 10 per day; fifteen in the bank and the others at the engine and washer. The engineer's wages are $1 25 per day. The engine is of 25-horse power, and requires the consumption of one-half a ton of coal per day. Pump connecting rods 200 feet long. The ore is shipped to Myers' switch, York and Wrightsville railroad, two miles distant. There is usually about enough of water. The ore is taken out by an inclined plane. The washer is 26 feet long, and a single cutter with 90 paddles.

The sides of the bank are about 40 feet high, and except 8 feet of stripping, of blue and yellow clay. On the east side of the bank a limestone dips west 18°, underlying the ore.

The ore is of two kinds. First, an arenaceous limonite, and secondly, a smooth compact mass of grayish blue color, and full of small cavities stained on the edges by limonite.

A number of specimens of the former kind were selected from all parts of the bank, and an average sample obtained which gave on analysis by Mr. M'Creath, in the laboratory of the Survey at Harrisburg:

	Per cent.
Insoluble silicious residue,	14.780
Sesquioxide of iron,	46.285
Alumina,	2.674
Manganese sesquioxide	22.888
Phosphoric acid,	1.491
Baryta,	1.322
Lime,	0.240
Magnesia,	0.155
Water,	11.200
Sum,	101.035
Excess,	1.035

This corresponded to:

Metallic iron,	32.400
Metallic manganese,	15.934
Sulphur,	0.027
Phosphorus,	0.651

The large percentage of manganese and the occurrence of baric oxide in this ore are both peculiarities that divide it from any other ore in York county as yet known. It is naturally a cold short-ore. The proportions in which it enters into the different benches were not ascertained.

An analysis by Mr. M'Creath, of the insoluble residue, was as follows:

	Per cent.	Per cent.
Insoluble residue,	14.780	
Silica,		11.190
Oxide of iron,		0.300
Alumina,		2.230
Lime,		0.020
Magnesia,		0.390
Barium sulphate,		0.390
	14.520	14.520
Undetermined,	0.260	

In this ore then there are 1.579 per cent of barium oxide, and but 0.053 per cent of sulphur.

There is no ore in York county, whose analysis has been obtained, which contains one-fourth so much manganese, and these two occurrences are not only exceedingly interesting in a mineralogical but also in a metallurgical point of view.

Besides this limonite of Smyser's bank, is the so called white ore, which resembles in general appearance a cherty limestone, but with a much higher specific gravity.

A specimen analyzed under the direction of Dr. F. A. Genth, by Mr. Alfred Pearce, was as follows:

	Per cent.
Ferrous carbonate,	77.990
Manganous carbonate,	0.450
Magnesium carbonate,	3.530
Calcium carbonate,	1.430
Alumina,	2.810
Silicic acid,	11.560
Water, organic matter and loss,	2.230
Total,	100.000

The metallic iron in this spathic ore is 37.65.

The existence of these widely different ores in the same bank, along with limestone, suggests the form in which the baryta occurs as carbonate, and would tend to support the view that the origin of the limestone is anterior to that of the Auroral, which lies in close proximity to it.

113. *Hake's Bank.* (*VI, 24.*)

Situated about two miles north of York.

Not now in operation. Excavation in clay.

114. *Benson & Cottrell's Bank.* (*VI, 25.*)

On Louck's property. Situated one-third mile south from the last mentioned.

Shafting was done three or four years ago; works located two years ago by Myers & Benson, who leased about 14 acres. There were employed at the mine last year about five men, who got out about 1,100 tons, (or about three to four tons per day.) About ten per cent is lump ore. The ore is used altogether by Messrs. Benson & Cottrell, in Marietta furnace. Wages, $1 00 per day of 11 hours. The ore is hauled to York for 50 cents per ton; three and a half to five tons hauled to the load. The deposit is tolerably regular, and has been proved for one-third of a mile. Breadth of ore bearing clay about 25 feet. One eight horse power engine. The washer, eight to ten feet long, diameter three and a half feet, with a single row of shovels. The ore is removed by carts belonging to the company.

The ore is reported to contain a little phosphorus and sulphur.

About 1,900 tons have thus far been removed. The chief want here is water. A magnetic sand and considerable quantities of anhydrous oxide are intermixed with this ore.

115. *Lightner's Ore Property.* (*VI, 24.*)

Situated about one and a half miles a little west of north of York.

An English company leased this property during last summer and were still engaged in sinking trial shafts in September 1874.

The ore which has been taken out was sent to Harrisburg and tested in the furnace, and was pronounced to be of the best quality. It is also reported to be free from phosphorus, with an abnormally high percentage of iron.

116. *Louck's Bank.* (*VI, 27; VI, 28.*)

Situated one and three-quarter miles due north of York.

This is an open cut about 15 feet wide, 18 feet deep and 50 to 60 feet long. The opening is in a bluish clay, soft near the surfaces and mottled with crystals, specks of undecomposed chlorite. The layers exposed in the cut are five feet of stripping and soil; then seven feet of yellow clay, containing ochreous iron; then a thin seam of white clay and chlorite, and underneath six to seven feet of clay, carrying segregated masses of ore. Dip of slate in bank, north 23° west, 46°. The general dip of the ore bearing stratum agrees very well with the dip of the rock. The ore is got out by pick.

117. *Smyser's Bank.* (*VI, 31.*)

This is an old opening about 2½ miles north by west of York. It was partially filled up, and had been abandoned, but was leased and opened in the fall of 1873 by Cottrell & Benson. Work was stopped last summer. They took out about 100 tons of lump, and 400 tons of wash ore. Six to 10 men were employed at $1 per day. Ore taken out by carts.

118. *Louck's Bank.* (*VI, 32.*)

Situated about 2¾ miles north north-west of York. Is an old abandoned pit. It was visited by parties who contemplated opening it last summer. Nothing showing; bank filled up. This bank lies almost on the edge of the mesozoic red sandstone, but belongs to the lower measures.

119. *W. R. Smith's Ore Pit.* (*II, 67.*)

Situated on old State road, about one-half mile west of the Conewago creek. The pit has been opened, merely for exploitation purposes, behind Mr. Smith's orchard. The ore which occurs with yellow argillaceous sandstones in blue clay and clay shales, appears to be principally micaceous and specular. A short distance west of Mr. Smith's occurs the great trap dyke which traverses nearly the entire length of Adams and York counties in an north-east direction.

120. *J. Lichte's Bank.*

Situated about twelve miles due north of Hanover, and one half mile from the Adams county line. It was opened in the fall of 1872. Two men are employed, and get out four to six tons per day. About 300 tons in all have been taken out. A trench 250 feet long, and generally about 18 feet deep, has been sunk, and a slope has been cut in about 30 feet. The ore is very hard, and is blasted and hoisted out on a wooden tramway. A dyke of hard blue dolerite appears here, dipping about north 10° west, 35°

121. "*Mine Bank.*" (*II, 67.*)

Is situated about six and a half miles south-east of Dillsburg. There are more than one operation on this outcrop, but the one hastily examined in the season of 1874, is worked by Mr. H. M'Cormick, of Harrisburg. This valuable deposit of ore strikes about north 23° east, dip west 23° north, 32°. It is mined by as haft 60 feet deep. The bed is, in places, nine feet thick. Eight men are employed in two shifts in the mine, and the work was being pushed day and night, (Aug. 20, 1874.) The wages of the men are $1 35 per day. The mine is kept dry by one 7-horse power engine. The consumption of fuel is about 50 bushels (two tons) a week of hard coal.

The ore is a micaceous ore, with much magnetite, and with considerable copper in certain seams.

It is in great demand for "fixing" (fettling) purposes.

It is hauled to Dillsburg for about $1 50 per ton, and shipped per Mechanicsburg Branch, Cumberland Valley railroad, to Harrisburg.

122. *The Logan Mine.* (*II, 74.*)

Is situated one mile north-east of Dillsburg.

The character of the ore resembles that of the Underwood and Mumper mines, and with the latter, is owned and worked by Mr. H. M'Cormick.

123. *Mumper Mine.* (*II, 74, 75, 76.*)

This mine is situated about one mile north-east of Dillsburg, and is opened in an argillaceous sandstone of the mesozoic series dipping, about north 10° west; 26°.

This mine is remarkable for the occurrence in it of a trap dyke, (dolerite,) which probably marks the line of a fault along which the measures have been elevated, according to a very plausible theory suggested to me by Mr. M'Cormick in the summer of 1874.

An analysis of the ore from the Logan shaft was made by Mr. M'Creath, with the following results:

	Per cent.
Ferrous oxide,	18.643
Ferric oxide,	42.100
Pyrites,	4.093
Copper sulphide,	0.098
Cobalt sulphide,	0.766

	Per cent.
Alumina,	2.417
Manganese sesquioxide,	0.186
Lime,	6.132
Magnesia,	6.738
Potash and soda,	0.350
Phosphoric acid,	0.052
Sulphuric acid,	0.119
Carbonic acid,	1.760
Water,	1.080
Silica,	15.120
Sum,	99.654
Loss,	0.346
Total,	100.000

In this ore there are contained:

	Per cent.
Metallic iron,	45.880
Metallic manganese,	0.129
Magnetic oxides of iron,	59.040
Ferric oxide,	1.703
Sulphur,	2.680
Phosphorus,	0.023

124. *The Underwood Mine.* (*II, 74.*)

Situated about one-fourth of a mile north of the Mumper. This slope is 300 feet in length. Fourteen men work in the slope and six outside. One 12-horse power engine supplies the power, consuming about two tons of anthracite per week. 30 to 40 tons of ore are extracted per day. The ore is shipped to the Pennsylvania steel company, Marshall furnace, and Newport, Perry county. Trap two feet thick dips with the bed.

It costs forty cents per ton for hauling to Dillsburg. Workmen's wages, $1 40 per day. Engine is worked till midnight and during Sundays, to keep the mine free of water. Fifty feet south of slope is a shaft fifty-six feet deep, in which ore, six to eight feet thick was struck.

The following analyses of the "Dillsburg" ores are kindly furnished by Mr. Felton, President Pa. Steel Company, from the records of investigations made by Mr. M'Creath:

	March 8, 1872. Per cent.	Aug. 30, 1873. Per cent.
Silica,	27.700	22.100
Ferrous oxide,	20.130	13.930
Ferric oxide,	44.732	45.640
Ferric sulphide,	0.742	1.052
Cupric sulphide,	trace	0.048
Manganese sesquioxide,	trace	0.652
Alumina,	1.050	1.824
Lime,	1.484	5.322
Magnesia,	1.837	4.308
Phosphoric acid,	0.038	0.024
Water,	1.580	5.000
Sum,	99.293	99.900
Undetermined,	0.707	0.100
Total,	100.000	100.000

A determination of the five more important constituents of another sample of this ore, made Nov. 15, 1873, was as follows:

	Per cent.
Silica,	23.879
Metallic iron,	37.430
Sulphur,	0.652
Phosphorus,	0.034
Water,	5.240
Sum,	67.235
Undetermined,	32.765
Total,	100.000

Eight determinations of the three constituents: metallic iron, phosphorus and water (the latter by loss of weight at a temperature of 212° Fah.) were as follows:

	Per cent			
	Sulphur.	Metallic Iron.	Phosphorus.	Water.
Sept. 4, 1873,	——	36.328	0.039	4.500
Sept. 10, 1873,	——	36.767	0.039	4.500
Sept. 18, 1873,	——	36.528	0.034	4.500
Sept. 20, 1873,	——	35.526	0.025	5.060
Sept. 26, 1873,	——	37.952	0.028	5.120
Oct. 6, 1873,	——	36.000	0.034	5.000
Aug. 15, 1873,	——	40.375	0.041	5.000
Apr. 22, 1874,	1.395	41.731	——	2.950

Omitting from the calculation this last ore, which the different amounts of water and iron mark as a separate variety, and of which no determination of the phosphorus is given, we have the following average percentages for the Dillsburg ore:

	Per cent.
Metallic iron,	37.068
Phosphorus,	0.034
Water,	4.811

An analysis of ore from the Fuller mine, on the Yellow Breeches creek, about three and a half miles from Dillsburg, gave:

	Per cent.
Ferrous oxide,	18.385
Ferric oxide,	43.414
Pyrites,	0.450
Cupric oxide,	trace.
Cobaltic oxide,	0.326
Alumina,	2.774
Manganese sesquioxide,	0.352
Lime,	7.563
Magnesia,	5.001
Potash and soda,	0.054
Phosphoric acid,	0.052
Sulphuric acid,	0.011
Carbonic acid,	1.640
Water,	2.320
Silica,	17.860
Sum,	100.202
Excess,	0.202
Total,	100.000

Corresponding to:

Metallic iron,	44.900
Metallic manganese,	0.245
Magnetic oxide of iron,	59.240
Ferric oxide,	2.560
Sulphur,	0.244
Phosphorus,	0.023

125. *Bender's Bank.* (*II, 69.*)

Leased by Stoner & Hildebrand; situated about one and three-fourth miles south-west of Dillsburg. The bank is cut into the soft clays on the south-east flank of the South mountain, and is 250 feet long and 50 feet broad.

The south half is filled with water. The first opening was made in the spring of 1873. There are about 20 feet of stripping, inclosing fragments of hard quartzite rock. The ore is a black limonite mixed with much clay.

It was said to have been hauled to Whitestown for $2 per ton, the team making one trip per day. Six horses haul three and a half tons to a load. There is one 12-horse power engine. There is an insufficient supply of water to wash the ore.

126. *M'Cormick's Bank.* (*II, 69,*)

This bank is close by the latter. It is has been disused for five years. There is still considerable ore showing in the bank and not much water.

NOTE.—*The previous seven banks or Nos. 119 to 126, inclusive, will be made the subjects of more detailed description in the report for next season.*

A specimen of ore selected by Major H. S. Mac Nair, from his farm in Adams county, on the Emmitsburg road and close to the Maryland line, showed the following constituents:

	Per cent.
Insoluble residue,	3.710
Iron,	53.700
Sulphur,	trace
Phosphorus,	1.197
Manganese,	0.446
Sum,	59.053
Oxygen and undetermined,	40.047
Total,	100.000

A specimen marked "Ahl's ore, from the Mumford farm, ten miles from New Oxford," of which analyses kindly presented by Mr. Fulton, of the Pennsylvania Steel Company, showed:

	Per cent.	Per cent. Metallic Iron.
Silica,	20.800	
Ferrous oxide,	5.142	3.999
Ferric oxide,	65.716	46.001

	Per cent.	Per cent.
Alumina,	4.032	
Manganese sesquioxide,	trace	
Lime,	3.836	
Magnesia,	0.256	
Phosphoric oxide,	0.139	
Sulphuric acid,	trace	
	99.921	
Loss,	0.079	
Total,	100.000	50.000

This ore may have contained as much as 11.426 per cent of magnetic oxide.

Another analysis of the same gave:

	Per cent.
Metallic iron,	40.250
Alumina,	11.600
Silica,	24.400
Lime,	6.048
Magnesia,	0.360
Sum,	82.658
Oxygen organic matter and undetermined,	17.342
Total,	100.000

A third examination on another occasion for iron, phosphorus and silica gave:

	Per cent.
Silica,	21.500
Iron,	52.000
Phosphorus,	0.058

Still another for the latter two constituents:

	Per cent.
Iron,	45.000
Phosphorus,	0.055

These datas are obtained from records of analyses by Mr. M'Creath, and inserted here by permission of the Pennsylvania Steel Company.

CHAPTER II.

Description of Cross Sections.

Eleven cross-sections have been made across the principal ore belt of York and Adams counties, to which most of the observed outcrops of limestone, schists, slate, &c., are referred, by co-ordinates, at right angles to the section lines, which latter run approximately from north north-west to south south-east, and are so represented on the map.

These sections are numbered 1, 1*a*, 2, 2*a*, 2*b*, 3, 3*a*, 4, 4*a*, 5, and 5*a*, and follow each other on the map, in regular order from east to west.

Section 1, represents the characters and attitudes of all the rocks exposed in the hill sides along the west bank of the Susquehanna river, from the bend opposite Chiques rock, two miles above the Columbia bridge at Wrightsville, to Bull's run, five miles below it. Its course is south 25° east.

Section 1*a*, lies eight and a half miles west of the Susquehanna, at Wrightsville, and runs south 25° east, from Smyser's bank to within quarter of a mile of Longstown; a distance of about four miles.

Section 2, runs eleven and one-third miles south 25° east from a point one thousand feet north of Emigsville on the Northern Central R. R., to a point on the Peach Bottom R. R. three-quarters of a mile south of the Red Lion tavern.

Section 2*a*, runs south 24°30′ east from 3.8 miles west 23° N. of York, ten miles, to Feigley's ore bank.

Section 2*b*, lies four and a half miles west of York and runs south 33° east from Little Conewago creek to near Falkenstein's ore bank; seven miles.

Section 3, runs south 41° east from the town of Nashville near the Pigeon Hills, to Shrewsbury Station, on the Northern Central railroad, sixteen miles.

Section 3*a*, runs south 34°30′ east from the Short Line R. R. south-west of the Sprenkle ore opening, on the Pigeon Hills, to Bachman Junction, on the Hanover Junction railroad; four and a half miles.

Section 4, runs south 35° east from the Abbotstown road, five and two-thirds miles north north-west of Hanover, to one-half mile south-west of the Hoffacker Ore Bank, ten miles.

Section 4*a*, runs south 35° east through Hanover, from the Littlestown railroad to the Maryland line, seven and a half miles.

Section 5, runs south 37°30′ east through Littlestown, Adams county, from one mile north-west of Littlestown to the Maryland line, three and three-fourths miles.

Section 5*a*, runs south 37°30′ east, one and a half miles south-west of the *Section* 5, from one-half mile north-west of the Frederick railroad to the Maryland line, one and three-fourth miles.

The dips from which these sections were constructed are accurately located, and their directions plotted on the large special map. The number accompanying each, refers to the strength, or angle of inclination to the horizon-plane.

Where insufficient evidence was at hand for the determination of the plane of a fault it has been drawn as if vertical.

SECTION NO. 1.

Section on the west bank of the Susquehanna River, from opposite Chiques Rock, through Wrightsville, to the mouth of Bull's Run.

This section, the most important of the series, because of the abundance and size of the rock exposures, might naturally be expected to furnish the key to the geology of both York and Lancaster counties. It was studied by Professor Rogers, in the First Geological Survey of the State, and is represented in part by his published section from Chiques to the head of Chesapeake bay.* But the section of Mr. Rogers was made up of a portion above Columbia, on the left bank of the river, and a portion below Wrightsville on the right bank. The new section is made out of observations confined exclusively to the right bank of the river, both above and below Wrightsville.

It is based upon a careful instrumental survey of the river bank, as shown in the map; all the exposures at, and above water level, some of them high on the hill sides (and in some cases back from the river, in the ravines) being referred to a straight line running south 25° east.

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* Final Report. Vol. I; page 184.

The observations are all plotted on the section so as to make the reader face the north-east, as in the case of all the other sections in this District.

The interpretation of the structure given in this section, differs in many respects from that of Mr. Rogers, as exhibited in his. Every observable dip has been studied, and many possible arrangements. The one adopted for representation must be regarded as the one at present most plausible. The difficulties encountered by the observer from frequent contortions and repetitions, the suspected presence of faults, and the absence of fossils, will become apparent in the course of the description. In a subsequent chapter these will be more fully discussed.

Description of Section No. 1.—Commencing at the north or left hand end of the line, about one and a half miles above Wrightsville, near the point around which the Susquehanna river bends abruptly opposite the Chiques rock, compact white to pink quartzite occurs dipping south—48°. The same rock appears dipping the same way (south 10° east—46° to 48°,) at intervals for three-quarters of a mile along the river bank.

Sandy slate comes in over it, and with similar dip (south 20° east—45°), at *b*, 3,040 feet from *a* the starting point. One hundred feet of it (measured perpendicular to bedding) are visible. It consists of fine grains of quartz, debris of the old crystalline schists ground almost to powder, with numerous spangles of micaceous iron ore.

Over this lie 1520 feet (actual thickness) of a more earthy slate, containing much more greenish matter, casts of pyrites and undecomposed pyrites imbedded in it.

NOTE.—*Here (at c) a dip north* 20° *west*—70° *was observed marking a disturbance, the exact shape and size* of *which could not be made out, for want of other exposures. It cannot be of great importance, seeing that, for the next* 1,200 *feet all the observed dips are again to the south, (from south to south* 15° *east,) and of the usual force (from* 50° *to* 68°).

In this first part of the section, then, we see a mass of quartzite passing upwards into sandy slates and argillites, about 5,000 feet thick, dipping southward down the river, at an angle of about 45°, increasing in steepness (but not with any apparent regularity) to 70°.

Limestone* sets in (at *d*) with an exposure 350 feet south of the last or highest observed outcrop of slate, (the slate dipping south 10° east—50°, and the limestone the same,) and in the banks of a small stream† entering the river half a mile above the Columbia bridge. The bed of this run must coincide closely with the line of contact of slate and limestone.

Limestone quarries are numerous for the next 1,600 feet of section. The strata are well exposed with dips to the south (from south 10° east, to south 15° east) and steep. The steepness of the dip constantly increases, following this range of exposures down the river side, being at first 56°, then 66°, at Kerr & Cook's quarry (*e*) south 4° east—76°, and in the town 600 feet west of the bridge, south 18° east—70°. There can be no doubt, therefore, of the shape of the curve of structure expressed in this part of the section.

The total thickness of limestone thus exposed measures 2,800 feet.

In Detweiler's, and Kerr, Cook & Co.'s quarries, the limestone is crystalline. In Detweiler's quarry the layers roll much; and a thin calcareous slate appears in the foot of the south wall. On the road, immediately south of the quarry, occurs a conglomerate of white (and less frequently pink) limestone pebbles in a blue limestone matrix, the difference of color being very distinctly marked.

Few good exposures of limestone are seen in the streets of Wrightsville for the next 1,000 feet of section. Then nearly vertical dips begin to appear, and persist as far as the mouth of Creitz's creek (which cuts off the lower end of the town); a distance of 2,300 feet along the line of section.

A synclinal trough of limestone has, therefore, been passed. At least this is the most natural interpretation of the exposures. The axis of the supposed synclinal would cut the river somewhat near the bridge (*f*).

The dips of the southern side of the trough are, however, not perfectly vertical. One on the hill top, 150 feet south of the York turnpike, reads south 10° east—83°. Another a few hundred feet away reads south—86°. Others range between these directions and strengths. They must all, therefore be considered as slightly *overturned.* But the uniformity within these narrow limits is sufficient to allow of an approximately true estimate of the thickness of the limestone mass; which, if no material error has been committed, is at least 2,800 feet. The thickness of the limestone exposed north of the bridge may also be reckoned at 2,800 feet. Therefore there is good reason for considering these two series as different sides of the same synclinal.

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* Auroral Limestone. Rogers.

† An 80° dip here is exceptionally steep; but deviations of this kind from the average dip are most frequently found close to the contact lines between successive formations.

From Creitz's Creek in Wrightsville to within 300 *feet of Wilton's run*, a distance of half a mile (2,500 feet,) the line of section traverses a belt of argillites, sandy slates and pyritiferous slates with chloritic matter dipping south, south 10° east, at various angles from 65° to 89° (?) or vertical. They appear to consist of the same materials as those north of Wrightsville; but bear, for the most part a surprising resemblance to limestone, of which substance, however, they are almost entirely destitute.

A study of the section line each side of Creitz's creek, and of the line of contact between the limestone belt north of it and the slate belt south of it, back from the river towards York, makes it impossible to interpret the structure here without the help of a fault. The contact of limestone and slate along Creitz's creek must be one of unconformability (*g*).

A study of the dips in slate between the two creeks, justifies their division into two series, thus (reading along the section line southward:) Creitz's creek; 60°; 80°; 65°; 70°; 50°; 75°; (*h*): and 90°; 90°; 90°; 85°; 87°; 85°; Wilton's run.

The first series occupies 1,200 feet of section line and 1,080 feet thickness of slates; the second series 1,200 feet both of slates and of section line. But 300 feet unaccounted for in the middle may easily make these two sides of the synclinal of equal thickness. The whole may be interpreted, therefore, as a tightly folded synclinal trough of slate.

Three hundred feet before reaching Wilton's run, the northern edge of *another belt of limestone* is seen. The last *slate* exposure striking east 12° north, and standing vertical; the first *limestone* exposure dipping south 5° east, only 54°.

A fault, therefore, separates the Wilton's run limestone belt from the slate belt north of it (*i*).

The Wilton's Run limestone belt is about an eighth of a mile wide, its rocks all dipping one way,* southwards; at the first exposure marked on the section (south 5° east—54°); and at the second (south 10° east—60°), giving an observed thickness of 500 feet of limestone and probably 1,000 feet, including a slaty layer which overlies the true limestone but seems to belong to it, before reaching Wilton's ore bank where the next belt of slate begins; for Wilton's ore bank, like all the principal banks catalogued in the foregoing chapter, lies on the junction line of limestone and slate.† (Ore and supposed fault at *k*.)

Crystalline schists—dark argillites and hydro-mica slates—succeed, and occupy the next mile or more (7,000 feet) of the line of section. Their outcrops form a face of very precipitous hill-slopes, thinly covered with the hardier mountain trees, along the river front, overhanging the canal, to within a short distance of the mouth of Cline's run. They widen westward, back from the river; narrowing the Wilton's run limestone belt to a point in that direction. Near their contact with the limestone, on the river bluff, a Baltimore company attempted to mine them for roofing slate, but without profit. They consist of layers of fine grained argillite, some of which is very dark in color.

The dips of the slate beds are all steep; but they can be grouped so as to suggest at least two overturned folds or anticlinals, thus:—

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* 800 feet from the mouth up Wilton's run two dips of N. 40° W. 48° were obtained in limestone. These are at present regarded as the results of local derangement.

† This bank furnishes a very good quality of iron ore imbedded in a yellow and red clay, free from grit. Anhydrous oxide of iron occurs in detached flakes here, and also small quantities of magnetic ore.

	Normal direction of dip.	Observed dip.	Distance S. from Wilton's ore bank in feet along line of section.	
Calcareous slate	S.	south 15° east—68°	400	
Mica slate	N.	south 10° east—85°	1,000	First anticlinal.
Mica slate		south 10° east—87°	1.200	
Mica slate		south 10° east—85°	1.350	
Argillaceous mica slate	S.	south 10° east—74°	1,430	
Argillaceous mica slate		south 20° east—68°	1.600	
Argillite slate	N.	south 10° east—88°	1.900	Second anticlinal.
Quartzite		south 30° east—36°*	2 150	
Slates		south 23° east—64°	2.400	
Compact chlorite slate; intersecting dips of laminæ		south 23° east—45°	2,550	
Slates		south 23° east—74°	2.800	
Slates	S.	south 15° east—56°	2,900	
Slates		south 15° east—56°	2.950	
Slates		south 15° east—74°	3.300	
Argillites		south 20° east—52°	3 900	
Mica slate		south 15° east—60°	4.800	
Compact chlorite slate		south 10° east—62°	5,950	
Compact fine grained chlorite Slate		south 20° east—70°	6,200	
Chlorite slates		south 15° east. vertical. (42°†)	6,580	
Sandy slate,		south 10° west. vertical, (32°†)	7,000	

That there is an overturned anticlinal at *l* is evident. There may be another at *m* between the dips 88° and 36°. There seems to be one also at *n*, between the dips 74° and 56°, and there may be others. There is almost certainly here exposed, a thickness of 4,000 feet of slates, between Wilton's run and Cline's run.‡

The first one-third of a mile of the measures above described, consists of argillites and hydro-mica slates; the rest belong rather to the class of compact chlorite slates. If the section be rightly constructed, the chlorite slates on the south overlie the argillites and hydro-mica slates to the north of them.

The southern limit of the chlorite slate mass is at a fault, which lets down against it the calcareous slates and limestones of the belt next to be described.

This supposed fault crosses the river at a point 1,400 feet above (north of) Cline's run.

A third limestone belt is now crossed by the section along a line of nearly two and a half miles (12,060 feet), to which must be added 1,000 feet, more or less, destitute of exposures, at its southern end.

Calcareous slates are first seen at *o* (1,400 feet north of Cline's run), dipping south 20° east—50°. In the next 650 feet, are seen rapid and confusing changes of direction and intensity of dip, suggesting the idea of a general disturbance in the neighborhood of the fault, or contact plane between this belt and that last described: south 20° east —60°; north 5° east—60°; —south 25° east—30°; south 20° east—88°; north 20° west —44°; vertical; and south 70° west—25°; the strata being much convoluted.

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* Possibly cleavage.

† Almost certainly cleavage.

‡ For the purpose of assisting the eye of the reader to catch at a glance the supposed structure of the slates, a narrow belt between *g* and *i*, and also one between *k* and *o* has been shaded.

On constructing the curves which these dips demand, the appearance is that of a sheet of paper crumpled on the edge. At Cline's run the limit of this disturbance seems to have been reached, and the dip of south—35° is observed. The first layers of limestone met with, are much intersected by quartz veins.

This dip probably continues comparatively uniform over 1,700 feet of a country where no rocks are exposed, to the northern bank of a small stream (*p*) where it is south 30° east —62°. Immediately south of this an exposure gives south 15° east—84°, and gives authority for the presumption, likely in the first place, that the bed of this stream lies in the synclinal axis of this basin or fold of the limestone.

		Dip.	Distance in feet south along section.
o.	Supposed line of fault		0
	Sandy slate, probably calcareous		120
	Limestone, sandy		250
	Limestone		500
	Calc. slates, much convoluted, vertical		600
	Limestone (Cl.) S. 20° E.—60°	south 70° west—25°	800
	Limestone	south—35°	1,080
	Cline's run		1,200
p.	Limestone	south 30° east—62°	2,580
	Small run (Synclinal?)		—
	Limestone	south 15° east—84°	2,700
	Limestone	south 20° east—72°	4,440
	Limestone quarry	south 17° east—64°	4,460
	Limestone	south 20° east—52°	5,320
q.	Limestone	south 22° east—72°	5,940
r.	Limestone (D. Leber's quarry)	south 30° east—89°	
	Fine grained soapy calcareous slates, with limestone	(Cl.) north ? west 50°	6,600
s.	Leber's mill		8,200
	Limestone in Cabin Branch Run	south 30° east—68°	8,640
	Calc. slate, with large pyrites	south 20° east—68°	8,920
	Limestone, (Detweiler's quarry)	south 25° east—45°	9,800
	Limestone, (old quarry)	south 10° west—45° south 10° west—50°	10,540
t.	Limestone quarry	south 25° east—64°	12,060
u.	Chlorite slates	north 30° west—50°	13,480

No exposures are visible for 1,660 feet south of the small run at *p*.

Then for a total distance along the line of 3,960 feet, there are exposures of limestone, varying in dip from south 15° to 22° east, and in steepness from 52° to 84°.

Here, between *q* and *r*, may lie the axis of another synclinal. Where the intermediate anticlinal axis should be located, does not appear. But if the proposed structure be accepted, there is here a possible thickness of limestone of about 1,600 feet; equal to the apparent thickness of limestone and calcareous slates between *o* and *p*, or between the little run and the fault north of Cline's run; where moreover, the line of the Keller and Emig ore banks would, if projected, strike the section line.

The possible second synclinal between *q* and *r*, shows one vertical exposure in D. Leber's quarry at *r*, 660 feet south of *q*, with marked cleavage (?) planes of 50° to the north-west. Leber's mill is 1,440 feet further on; and 400 feet more brings the section line to the Cabin Branch, where limestone is seen dipping south 30° east—68°; and 310 feet further, calcareous slates, with pyrites, dip south 20° east—68°.

According to the best interpretation of these last dips, they mark the lower edge of a rising wave of limestone which sinks again about 1600 feet south of the latter (at the point *s*) with a dip of south 25° east—45°; which would place an anticlinal axis between these last two exposures.

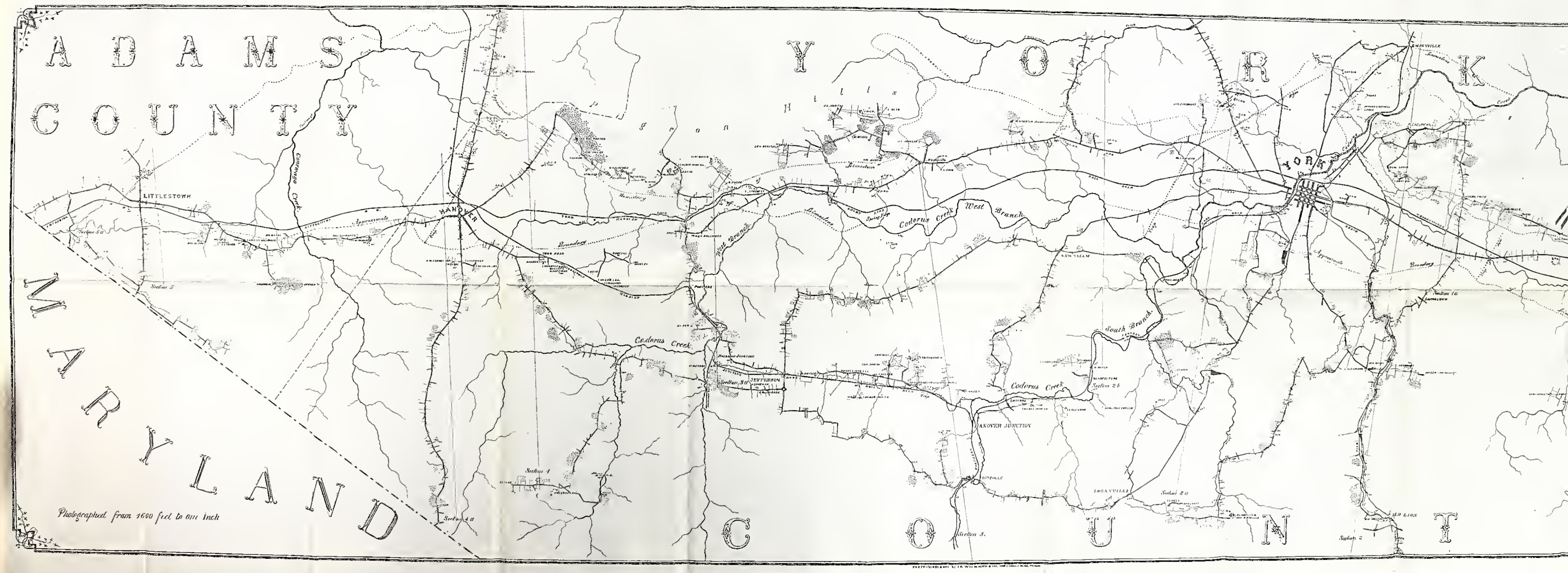
If these rocks be considered as the lower members of the limestone mass, then the anticlinal will lie somewhere near Cabin Branch, and the thickness of the mass thus exhibited cannot well be less than 2,600 feet.

From the place of the last dip of the limestone, (*t*,) for 1,400 feet through a ravine, there are no further exposures; but at this distance the precipitous hills of compact crystalline schist recommence with a dip of north 30° west—49°, to 52°, (*u*). This is immediately followed by dips of north 25° to 28° west—68° to 77°. In the section of these same beds, made during the previous survey, the dips above referred to are considered cleavage dips, and the succession of measures is considered conformable throughout the whole length. At this point, near "Bull's run," the limestone series is drawn as if it rose over the slate hills last spoken of. But a careful study of the quarries failed to show any sufficient reason for not accepting the planes of lamination as those of bedding. So far as could be ascertained the rock was homogeneous in those planes. Still this point must be reserved for future determination, and the interpretation of this section above given, must be accepted only as the best explanation that I can give with my present light.

Recapitulation, returning along the section northwards:—

According to the above data, this section reveals three belts of limestone and four of slates. The first (southern) belt of the lower formation ends at Bull's run, (*u*,) and the calcareous strata commence with a large anticlinal, exposing the most if not all the members of this series. In the 2.3 miles of the latter which follow, there are two anticlinals and two synclinal axes, the northern margin terminating with much distortion against a fault. North of this fault is a broad folded and, perhaps, collapsed anticlinal, 1.2 miles between the limbs; of which the northern is the steeper, as in all cases on this line. Here another fault separates this formation from the second limestone belt, which latter is a little less than one-fourth of a mile in extent, and indicates the northern half of a synclinal. The next synclinal is of slates, and terminates with distortion against another basin of limestone. This belt of limestone, about one and one-fifth miles in breadth, and including the town of Wrightsville, represents a tolerably regular synclinal, with the southern side the steeper and the northern slightly waved and lying conformably upon the sandy slates, which, in their turn, rest upon quartzite.

This construction requires certainly four and perhaps five faults within a space of six and a half miles, as follows: One at Creitz's creek; two, twelve hundred feet apart, on the opposite sides of Wilton's ravine; and one between the slate and limestone north of Cline's run. The fifth, at the unconformable contact at Bull's run, is not a necessary assumption; since the nearest exposures in the respective formations are too far apart to permit the manner of contact to be portrayed with certainty. In favor of the fault at Cline's run may be adduced the cleavage of south 15° east—42°, which suddenly appears in the slates just north of the contact. For the cleavage planes are perpendicular to the lines of greatest pressure, and the perpendiculars to these planes represent the direction along which



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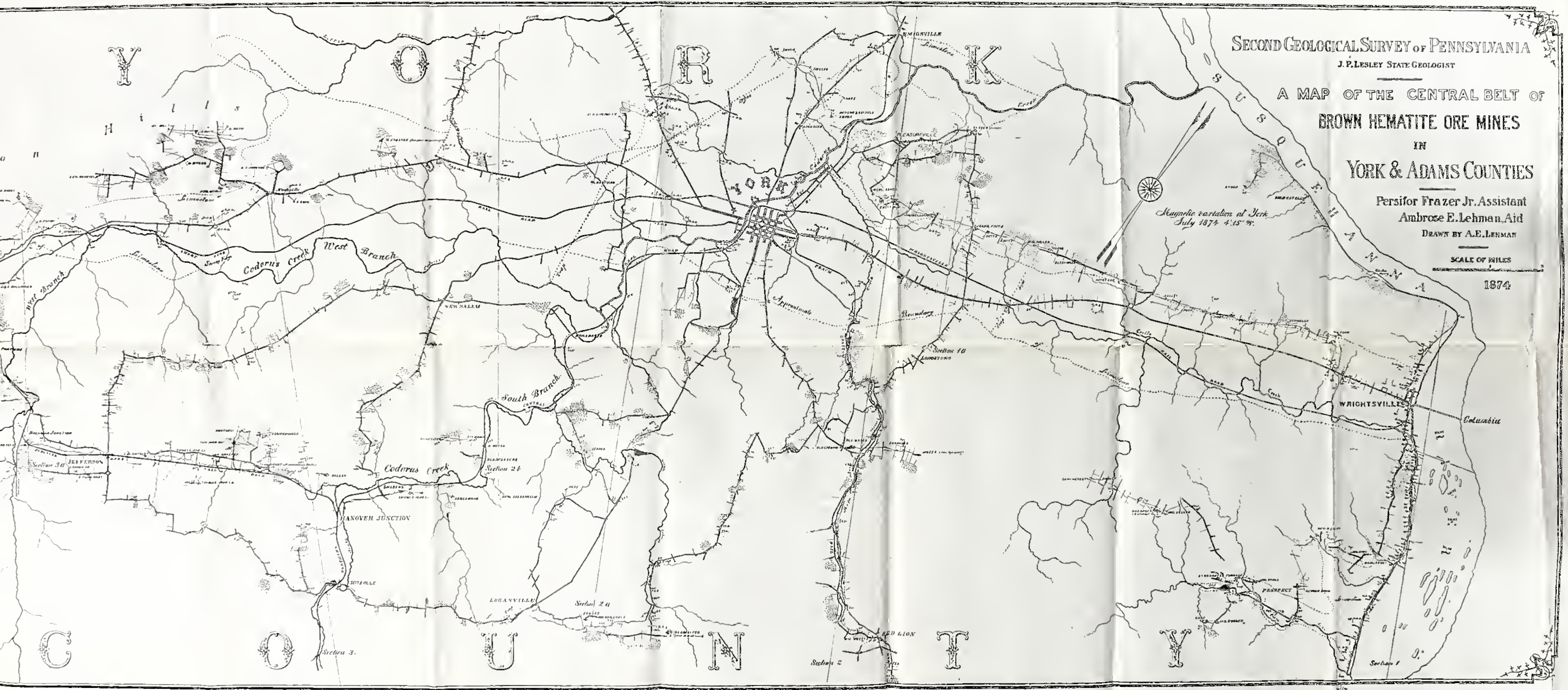


SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA

J. P. LESLEY STATE GEOLOGIST

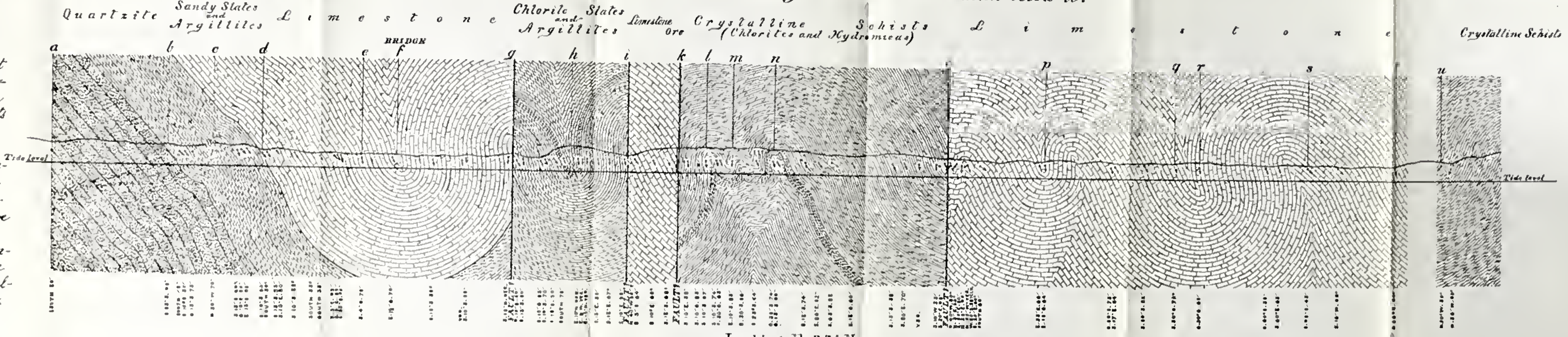
A MAP OF THE CENTRAL BELT OF BROWN HEMATITE ORE MINES IN YORK & ADAMS COUNTIES

Persifor Frazer Jr. Assistant
Ambrose E. Lehman, Aid
DRAWN BY A. E. LEHMAN

1874

Section 1. Along the right bank of the Susquehanna from Chiques' Ridge 2 miles above the Columbia bridge, to Bull's Run 5 miles below it.

The middle straight line represents tide level, and the profile the relative heights of points on the surface above this datum. The upper and lower lines between which the structure is filled in, are respectively 2800 ft. above and below the datum plane and serve to indicate indefinitely the erosion which has moulded the present surface.



Looking E. 25° N.

SCALE 1600 FT. = 1 INCH

To accompany P. Frazer Jr's. Report of Progress in the York district for 1874

A. E. Lehman Fecit

the greatest resistance to the downthrow must have been exerted.

Description of Section 1*a*.

The line of this section runs south 25° east through the new Moser bank. Commencing at the north-western extremity the limestone in Smyser's bank dips west 26° south—18°. Close by a quartzite dips south 30° east—34°.

The sides of the range on which the ore occurs are much filled with loose boulders and debris, so that for little more than a mile and a quarter no dip was recorded. The next (7,880 feet from the starting point) is in crystalline schists which dip south 30° east—65°. The ore range on which are the Fritz & Heidelbach banks crosses the section line immediately south of this exposure,* and is succeeded by the northern edge of the limestone, 1,680 feet south 25° east of the above slate with uncertain dip. In the succeeding one and one-fourth miles the dips in the limestone are south 25° east—vertical, and south 35° east—45°.

About 4,000 feet further on, the slates occur dipping south-eastwardly, but the direction and strength are both uncertain.

The intervening distance between the last two dips is deeply covered with soil. The line of fault previously referred to, if persistent, would cross the section line within this space. This brings the section to its termination half a mile north of Longstown.

Continuing along the same line from the termination of the section the next five miles appear to be filled by a broad synclinal (?) of slates, in the interior of which the prolongation of the Cabin Branch limestone might be expected, if it continue westward; but this limestone itself was not observed on the line of the section. A limestone (Feigley's) which occurs on the same range in another section raises a question as to the horizon to which it should be referred. Some facts would seem to show that it was older than the York limestone, although in general appearance it might be easily mistaken for the latter. To recapitulate:—

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* The outcrop of limestone nearest to this exposure and giving a dip, is one about 3,600 feet southwest and nearly half a mile off the section line. It dips south 40° west—19°. This direction is abnormal and may be regarded as one of the many local variations observable in the limestone, when the angle of its inclination to the horizon is small.

Beginning on the north-west, quartzites, crystalline schists, &c., dip south of east with different degrees of strength, but more steeply than the succeeding limestone, which, in turn, exposes only one-half of a synclinal basin, the south-east half being missing; and probably rests unconformably against the hydromica slates. These latter seem to exhibit two complete waves in six miles, a north-westwardly dip of the last one being the limit of the section.

Description of Section No. 2.

Section 2 runs south 25° east from a point on the Northern Central railroad, a little less than a quarter of a mile north of the town and station of Emigsville to a point on the Peach Bottom railroad, 4400 feet east 40° south of the Red Lion tavern.

The total distance along the line of section from the point in the Mesozoic sandstone where the first dip was obtained to the mica schists at the locality south-east of the Red Lion on the P. B. R. R. is 60,080 feet, or a little over eleven and one-third miles.

This line of section is nearest to York at a point not far from its intersection with the Wrightsville branch R. R., whence York bears west 25° south distant about 2.1 miles.

Commencing as above stated in a railroad cut just north of Emigsville the Mesozoic strata are well exhibited but under conditions entirely different from those governing any other exposure visited in York or Adams counties. Here at the northern end of this cut the dip of a fine-grained red sandstone is west 15°, north 52°. This material fills from a third to a half of the northern side of the hill.

Following this southward over the surface is an exposure for about 42 feet of a calcareous sandy pink shale dipping south 5° east 20°, over which for 27 feet comes a blue finely laminated limestone with white streaks, and upon this rests a red calcareous conglomerate two feet thick. This underlies a belt of reddish shaly sandstone 63 feet in breadth. Next above come nine feet of compact fine-grained sandstone, and capping all, one hundred and fifty-six feet of arenaceous shales of a somewhat flaggy character.

The dip of all these but the first is about south 5° east—20°.

There would seem therefore to be an anticlinal in the Triassic measures—the only instance of one recorded within the limits of this district. The contact line of limestone and Mesozoic sandstone lies within, or just north of, the town of Emigsville, but the first recorded dip in the older formation when projected upon the line of section is 2,160 feet or a little more than a third of a mile from the last dip. The outline of the area of limestone is here a very complicated one. The northern edge of the belt which crosses from Lancaster county at Wrightsville and runs south-westwardly, turns north at or near Lightner's bank, and after sweeping north-east, east, south, again east, then north-west, again east to Smyser's bank, crosses the Codorus creek, about one and a half miles north of the last-named locality and turns abruptly upon its course, running about south-west past Louck's bank, and near Beeler's cross roads and forming the upper boundary of the reunited limestone belt which passes at no great distance from the Gettysburg turnpike to the Pigeon Hills, which it partly overlaps. The dip last-mentioned on this section was obtained on that part of the limestone where the second abrupt change of direction produces a peninsula-shaped prong encompassed on three sides by underlying schists.

As represented on the map the southern edge of this prong of the limestone crosses both the line of section and the Codorus creek, 3,000 feet further south 25° east from the above dip. 3,800 feet further down the line from this triple intersection we have a dip in schists of north 25° west—46°.

640 feet further on occurs the projection of the second dip given in section 1*a*, a quartzite forming the ridge which runs from York to Chiques' rock dipping south 30° east—34°.

The exposure from which this dip was obtained is three quarters of a mile north-east of the section line, and its importance would be much diminished owing to this remoteness, were not the topography such as to give every guarantee of the persistency of this rock under the same conditions of structure for a considerable distance. The dip was obtained close to the north-east limit of the village of Pleasureville. 1000 feet further on the line appear crystalline schists dipping south 30° east—85°.

The structure possibly agrees with that along the bank of the Susquehanna north of Wrightsville where the quartzite is overlaid comformably by the same schists.

It is nearly unavoidable then, to consider these outcrops grouped about an anticlinal axis, and this assumption is consistent with the facts next to be noticed.

5,000 feet further down the section line from the place of the last-mentioned (vertical) dip, there are situated two ore banks (Ebert and the Corr,) close to our line.

The dips obtained in these excavations were somewhat inconsistent and confusing, but can nevertheless be divided into two *northerly* dips of west 20° north—70°, and north 15° west—35°, and one *southerly* dip ± south-east 70°.

It is very significant that the latter of these northerly dips is in quartzite resembling that near Pleasureville. As constructed there is a synclinal valley between these two quartzite outcrops which are thus considered continuous.

Again, with the south-east dip this (near the lowest member of the series) sinks deeper beneath the surface, while the belt of limestone, whose northern margin is distant about half a mile, is seen to come in conformably (?) on top of these schists just as the same measures do north of Wrightsville. From the first exposure of quartzite in place—the York county continuation of Chiques' rock north of Wrightsville—to the top of the limestone series and perpendicular to the bedding, the thickness of quartzite, slate and limestone taken together is about 7,000 feet. According to the best hypothesis of structure the thickness of the beds from the quartzite of Ebert's mine to the top of the limestone series is about 7,320 feet.

5,200 feet on the line from these banks, or about one mile south 25° east, a dip in the limestone formation of south 22° east—34° is found, and within the next one and one-third miles between this point and the southern margin of the limestone are two dips south 45° east—55°, and south 45° east—35°, the latter close to the line of fault supposed to be continuous from Creitz's creek to this point, and separating the limestone strata from the schists.

In the remaining 6.1 miles of this section along the Peach Bottom railroad the exposures are only sufficiently numerous to prove the enormous thickness and comparatively simple structure of these crystalline schists. Thus between the dip last referred to on the southern margin of the limestone and the first visible synclinal axis, a distance of 2.1 miles, the dips vary from south 19° to 45° east, from 50° to 70°. If all these exposures belong to one side of a synclinal fold their actual thickness can scarcely be less than 9,600 feet or 1.8 miles.

But the synclinal is very narrow—a mere curl in the measures which, after bending sharply over an anticlinal axis situated about 2,200 feet further on the line than the position of the supposed synclinal axis, continue to descend and bring newer rocks to the present surface for a distance of 10,800 feet (or a little over two miles,) along this line. Allowing for the repetitions of strata caused by these folds, this last southern limb of an anticlinal would add to the total thickness exposed from the limestone belt 7.800 feet or 1.47 miles. The total thickness therefore, of these schists *seems to be* at least 17,400 feet, or a little less than 3.3 miles.

In the remaining one and a quarter miles of this section there appear to be one anticlinal and two synclinal folds made up of strata already passed over.

Returning *backwards* over the line from the Red Lion north 25° west, we find an immense thickness of crystalline schists exposed for over six miles where the main body of the Wrightsville limestone is entered.

From here it is about 2.15 miles to the axis of quartzite referred to before, the measures seeming to lie conformably upon this rock, the limestone on top and the schists in the middle, all dipping at moderate angles. A synclinal of 1.2 miles here intervenes between the two outcrops of this quartzite, which at its north-western exposure forms the nucleus of a ridge connecting with Chiques.

The exposures are too meagre to enable the relation of this quartzite to the limestone prong near the point of commencement to be drawn with certainty. The distance to the next dip in limestone being a little more than one and a-half miles.

Just beyond this dip and near Emigsville the New Red sandstone appears to rest unconformably against the limestone and exhibits the anomaly of a small anticlinal, the southern edge of the beds dipping gently south 5° east.

SECTION 2*a*.

This section line runs south 24° 30′ east from a point on the York and Dillsburg road, one mile west of the line of contact between the new red sandstone and the limestone at Beeler's cross-roads, and 3.8 miles west 23° north of the town of York, to an exposure of limestone in the ore bank known as Feigley's and ten miles from the starting point.

At the point of commencement the formation is the New Red or Mesozoic sandstone, and the exposure of red shale is seen to dip north 45° west 15°. 3,800 feet on the line from this point another exposure is noted in calcareous purple sandstone, between layers of red shale, dipping north 70° west—22°.

Below this and at the foot of the hill and in the immediate vicinity of Beeler's crossroads occurs the coarse Triassic conglomerate with large pebbles, dipping north 60° west 80° (*a*).

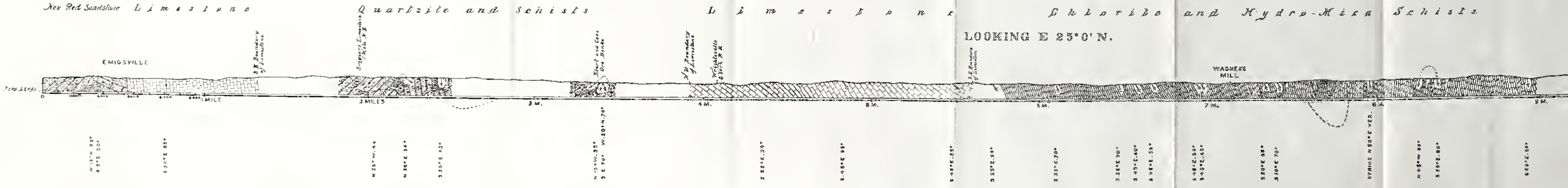
Here about two and three-fourth miles north 40° west of York is the lower edge of the Mesozoic sandstone, which is separated by a narrow belt of slates from the York limestone. The latter is disturbed and exhibits much rolling and contortion, with however comparatively gentle dips. This disturbance is perhaps mainly due to the presence of a dyke of dolerite, which breaks out of the Mesozoic sandstone from the direction of Emigsville, and cuts through the larger part of the limestone belt. The confusion is more apparent a short distance south-west of this point. In the line of section indicated, the limestone appears to form one synclinal and one anticlinal wave. At the edge of the Mesozoic sandstone, in the cross-roads near Beeler's house, the dip is about north 60° west—80°. Following this east for about 100 yards to the summit of a low hill of slates, there occurs limestone in place (?), dipping about north-east 25° (??). A few paces further east, on the opposite slope of the hill, a white saccharoidal limestone is found, united to and passing into a sandy slate, in the direction perpendicular to the planes of bedding.

The unusually steep dip north 60° west, 80° in the Mesozoic conglomerate is doubtless due to the local influence of the cleft

SECTION 2. FROM EMIGSVILLE THROUGH RED LION STATION.

TO ILLUSTRATE REPORT OF PROGRESS OF THE SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA IN THE YORK DISTRICT FOR 1874.

The true structure of the portions of the Section lightly drawn, is doubtful



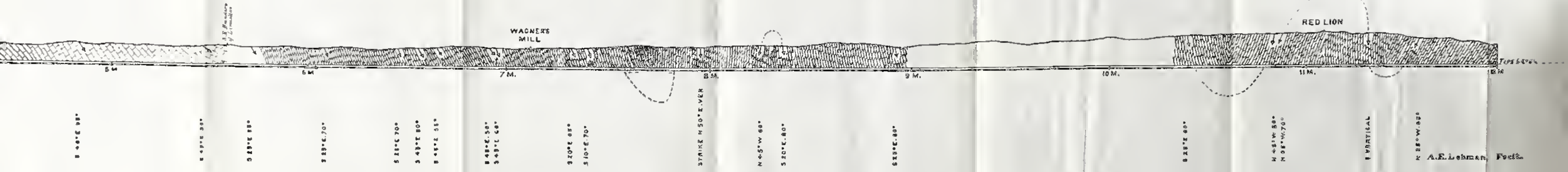
FROM EMIGSVILLE THROUGH RED LION STATION.

E REPORT OF PROGRESS OF THE SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA IN THE YORK DISTRICT FOR 1874.

The true structure of the portions of the Section lightly drawn, is doubtful

estone *Chlorite and Hydro-Mica Schists.* *Coarse Mica Schists.*

LOOKING E 25°0' N.



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along which the trap dyke just south-east of here, has broken out from below. A few hundred feet from this exposure on the line, calcareous slates enclosing a dark and white bed of limestone, dip east 30° south—40°. After a narrow and shallow synclinal of 500 feet in breadth, and a low flat anticlinal of 2,000 feet, follows an important half mile in which no exposures were observed. If in this space there be not a north-westerly (or its equivalent, a steep south-easterly) dip representing the southern limb of a synclinal, it seems impossible to avoid a construction which, locating the axis of the anticlinal a short distance below the surface on the line *b*, brings down continually newer rocks to the junction of the limestone and schist near the bed of the Codorus. But this construction would give an actual thickness of rock between the limestone near *a* and that of the last exposure near *e*, of about 8,000 feet, a thickness two and a-half times that observed on Section No. 1. There are other reasons here for suspecting a non-conformable contact of a lower and an upper limestone somewhere near the intersection of the dyke of dolerite at *c*. Presuming, then, the axis of the separate synclinal of upper limestone to exist near *d* it would be about 4,000 feet thick.

5,000 feet from *e* (the margin of the limestone) the hydro-mica schists appear dipping south 55° east—59°, followed by quartz slates, whose direction is about the same and the inclination 80°.

From the first observed dip in crystalline schists on the section line south-east of *e* to the last *moderate* south-east dip (south-east—58°) is 6,120 feet over the surface and section, and requires at least 5,000 feet actual thickness of these schists. 3,720 superficial feet again intervene between this dip and the next which is vertical. Between these two there lies at least one (and perhaps several) synclinal axes, which there is yet no means of accurately locating. If there be one only near *f* all the measures which descend north of that point will rise south of it between *f* and *g*. The next two exposures south-east of *g* are at distances of 200 feet and 2,200 feet respectively. The dip of the latter north 60° west—64° lends a powerful support to the supposition that the former really represents the descending limb of an anticlinal whose axis must be within the 200 feet which separates it from *g*, though the inclination is so steep (84°) that its unassisted testimony to this effect would carry but little weight. Here at *h* is probably a sharp anti clinal. Another at *i* is supported by the same kind of proof, viz: a north-westerly dip followed by a moderate dip (east 20° south—42°) near *j*, the latter very clearly indicating an anticlinal, and a sharp synclinal at *k*.

From here the line is destitute of exposures for 6,560 feet further on, or to *l*, and there are no data for completing the structure between these points.

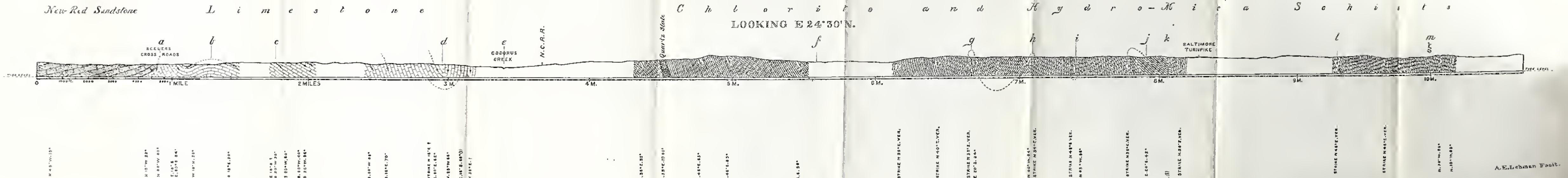
From *l* the dips are nearly or quite vertical to *m*, where the Feigley & Brillhart ore crosses the section. In the midst of this ore and on its north-west side is the limestone before referred to which seems to be intercalated with the crystalline schists (and therefore to be lower than the York limestone) and at this point to lie somewhere near the middle of a deep synclinal trough, since the last dip obtained on the line in crystalline schists was north 20° west—85°. This latter statement is however intended to be purely hypothetical, since the deviation from the vertical is but 12° and may well be due to a local wave in the strata.

SECTION 2*b*.

This section runs south 33° east from Emig's Mill to Falkenstein's bank; 7.1 miles. Commencing with a north-west dip in the Mesozoic sandstone opposite the mill on the Little Conewago Creek, New Red sandstone dipping north-west—30° is followed for 1.6 miles, where a trap dyke is met, crossing the intersection of limestone and New Red. Within the next succeeding 2000 feet, the limestone dips south 35° to 25° east—40°. A short distance further on, this dip increases to south 30° east—60° and then south 20° west—20°. For the next two miles or more, no outcrops are recorded, and the next rock distinguishable is a crystalline slate near New Salem, dipping south 15° east—64°. Again, after an interval of two miles barren of recorded dips, occur hydro-mica and chlorite slates, striking north 35° east, vertical, and continuing for 1.3 miles, where occurs a dip of south 45° east—64°. Here this section ends at a point on the N. C. R. R., midway between Smyser's and Brillhart's stations.

SECTION 2a. FROM WEST OF BEELER'S CROSS ROAD TO FEIGLEY'S ORE BANK.

TO ILLUSTRATE REPORT OF PROGRESS OF THE SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA IN THE YORK DISTRICT FOR 1874.



A.E.Lehman Fecit.

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Though the data on this line are insufficient to permit of a reproduction of the bed structure, yet some important points deserve notice.

There is evidence from boulders and fragments lying about the surface, of the presence of a dyke of trap in the neighborhood of the southern end of Logansville 2.15 miles from the termination of the section on the same line, although no topographical evidence is observable nor is this rock found in place. This, however, is a very usual circumstance in this region, where the conditions are such as to permit very free access of the atmospheric influence to large masses of rock. It is a law of the formation of these dykes that they radiate out from certain centres, and branch from secondary centres; and it is another almost universally observed fact, that the original centres are confined to the area covered by the Mesozoic strata. It is in the highest degree probable, therefore, (though not demonstrable) that the dyke, part of whose debris was found near Logansville, issued from some point in the New Red sandstone, and penetrated all the measures between Logansville and that formation, and one would look at its least remote margin to seek evidences of this action.

About seven and a half miles north north-west of Logansville, and almost at the nearest point on the New Red sandstone, is found that somewhat remarkable dyke which crosses the Carlisle road near Beeler's house. An examination of the special map will show that this dyke forks into several branches somewhere near Dr. Eisenhart's property, and almost certainly joins another dyke, which is very largely developed a mile or more further west. One of the prongs from this igneous centre was traced across the west branch of the Codorus, north of New Salem, but there its trail was lost. Between the point to which it was traced and the south end of Logansville, there intervenes about six miles.

If we may suppose then that this dyke originally pursued this course, it would indicate the existence of a cross fracture nearly north and south, which cut the measures obliquely. This line of fracture could easily become a line of cross fault and side thrust, were the conditions favorable. Now as to the facts: a line of more or less regular deposits of ore is followed from the Susquehanna, at the Margaretta furnace, to Littlestown. With only two breaks the banks are so thickly strewn along this line that a stranger may follow it by the engine house chimneys, and dump piles.

These exceptions are: First, a break of continuity of about two miles lying east of Longstown, perhaps not entirely exploited; and second, a gap of three miles due north of the Feigley and Brillhart ore, and so situated that were the country, including these three banks, moved up bodily three miles to the north, this gap would be completely filled. In the case of the other hiatus, there is no outlying group of deposits which looks like a slice taken out of the line. Pursuing the strike of the rocks at Feigley's towards the north-east, we come upon a ferruginous slate, almost an ore, at the Red Lion summit, Peach Bottom railroad, and indications in the neighborhood of the existence of ore. But south-westwardly of this point, there is no more indication of a paying deposit, although the Feigley and Brillhart bank is one of the most extensive in the county; unless, indeed, we assume the isolated Hofacker bank, twelve miles distant, to lie in the same horizon—a very hazardous assumption, though it must be confessed one strengthened by the close chemical resemblance between the limestone at Feigley's and that near Allison's mill; a resemblance elsewhere adverted to.

On the other hand, a line drawn through the southern end of Logansville and the G. Leader and S. Hess deposits, actually cuts the trap dyke spoken of at its secondary centre of radiation. North-east of the line and north of the Feigley-Brillhart-Gladfelter range, there is no ore until the very large deposit of the Moser bank is reached; south-west of the line, on the strike of the Feigley bank, no deposit has been yet discovered, but three miles north is the well-known and richly productive range along the Hanover Junction railroad.

This is merely a possible hypothesis, but one worthy of attention, because it serves to illustrate the extent to which the geology of this region may have been modified by faults.

The slates which occur here may possibly represent those between Wilton's and Cline's runs on the river. If so, the occurrence of ore along the tributaries to the South Codorus, from Porter's siding to Hanover Junction, would conform to the general law which seems to determine such beds along lines of fault, as well as in definite horizons of altered iron minerals. The general directions of the streams would, on this hypothesis, mark the general direction of the two faults bounding these slates.

Description of Section 3.

The line of this section is south 41° east from W. S. Johnson's ore property, on the south slope of the Pigeon hills, to New Freedom, on the Northern Central railroad.

Commencing near Nashville, this line crosses about one and one-fourth miles of limestone, reaching the margin of the York limestone on the banks of the west branch of the Codorus. The dips steepen to the south-east, and this belt of limestone rests unconformably (at a fault dividing this formation at the Codorus) against the crystalline schists beyond it.

The schists commence with comparatively gentle dips of south 45° east—32°; south 30° east—40°. An interesting item in this section is the band of impure rusty limestone of unknown thickness, which gives the first of these dips, and is followed by a large mass of schists, composing the hill, which overlie it. In appearance this limestone resembles that at Allison's mill, in the Sprenkle ore shaft, &c., and probably is not in any way connected with the York limestone.

About a mile and a half further on, a dip of north 35° west—45°, seems to indicate an anticlinal, but the normal south-eastwardly dip is resumed at a short distance beyond it.

The belt including the Strickhouser, Knotwell's and York Iron Company's ore, distant about one mile, furnishes the next synclinal. The dip upon its north-western side is east 8° south—66° near Knotwell's ore shaft, while the main body of the slates in Strickhouser's ravine are vertical.* Two synclinals follow in the next mile, which brings us to the limestone quarry of Mr. Zigler. The limestone is quite thinly laminated and light blue in color, and resembles that of Feigley and Brillhart. Its occurrence here, as well as this resemblance and the considerations associated with its Logansville counterpart, might seem to imply that it belongs to these older schists, but its dip differs in so marked a manner from the schists on both sides of it that it may be an isolated patch of the York limestone which has escaped denudation, and it is so represented.

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* In projecting the Knotwell & Strickhouser outcrops upon the line of section, the plan of locating them at the intersections of perpendiculars to the section line drawn through each outcrop was deemed unsafe, owing to the remoteness of the exposures and the sensible deviation of the strike from such perpendiculars. The strike line at the two ore pits was considered a safer guide, but yet could not be taken without modification, because there is evidently a curve in the strike lines near this point. This was hypothetically allowed for, but not with sufficient accuracy to enable one to form an exact idea of the breadth of the synclinal whose separate limbs they represent, nor of the real mass of measures which interpose between them and the shortly succeeding north-west dips which occur very close to our imaginary line.

Within the next three-quarters of a mile, or between the Hanover Junction and the outcrop of schist just south of Zigler's quarry, there is but one exposure and dip, and consequently no continuation of the structure over this region is at present possible.

About fourteen hundred feet south of Hanover Junction there appears to be an anticlinal axis, and at four thousand feet a synclinal axis whose southern limb rises through Seitzville Station. A little less than a mile and a quarter from Hanover Junction near the station of Seitzville a calcareous impregnation, accompanied by geodes of crystallized calcite is observed.

There are indications of three anticlinals and three synclinals between Seitzville and Glen Rock.

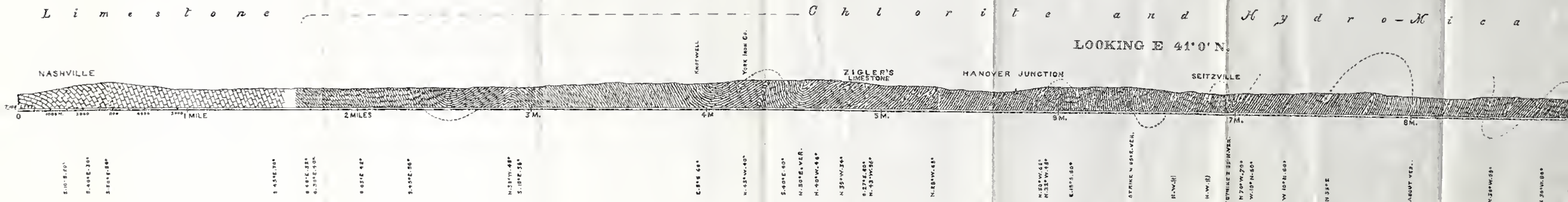
It is not difficult to construct a curve which will agree with the observed dips and connect together the calcareous impregnations at these two points. This is indicated in the section. At Glen Rock, is a breadth of over 1,000 feet of slates impregnated with carbonate of lime and containing small inclosures of crystallized calcite throughout its mass. A mile and a quarter further down the line, reaches the southerly or upward sloping side of a synclinal (?), whose northern side possibly furnished the calcareous deposit near Glen Rock, and here, in addition to a general saturation of slates with carbonate of lime, large and numerous veins of calcite occur. From here to the end of the section, south of Shrewsbury, the dips are similar. Two-thirds of a mile from the last-mentioned calcareous slate, occurs the "Help bank," the ore from which contains, like the neighboring rock, over ten per cent. of carbonate of lime.

The breadth of this calcareous outcrop here is over half a

SECTION 3. FROM NASHVILLE TO SHREWSBURY.

TO ILLUSTRATE REPORT OF PROGRESS OF THE SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA IN THE YORK DISTRICT FOR 1874.

The true structure of the portions of the Section lightly drawn, is doubtful



TO SHREWSBURY.

PENNSYLVANIA IN THE YORK DISTRICT FOR 1874.

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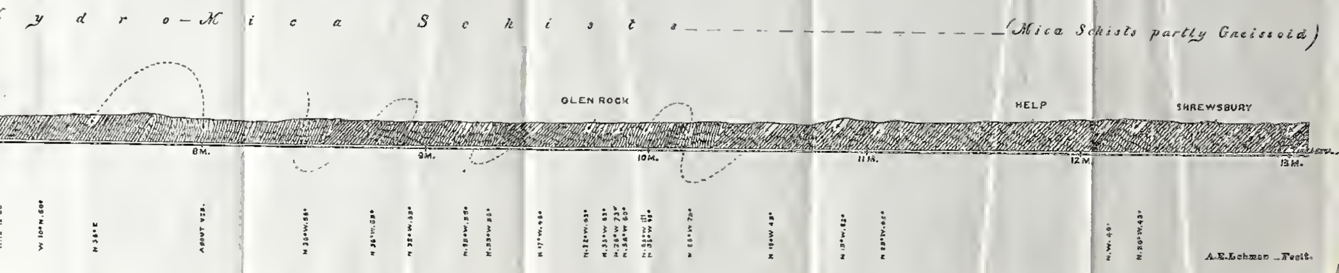

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mile. Just south of the ore and beneath it, is an outcrop of much weathered gneissoid rock, containing countless pits, formerly filled with pyrite and now ferric hydrate.

About seven-eighths of a mile further south, at Shrewsbury station, in the beer-vault excavated in the side of the hill, the rocks are distinctly gneissoid. From there to the Maryland line, they gradually lose their crypto-crystalline and glistening character, and become a true coarse mica and gneissoid chlorite schists and slates, the thickness of the bedding being variable.

A point of considerable geological interest is situated a little more than a mile south-west of the portion of this section line first described. It consists of a contact of limestone and slates in a large quarry, situated on the line of the Hanover and York Short Line railroad, and about one-third of a mile south-west of Spring Forge station. A cut of 150 feet through slate and limestone opens into a large excavation, the two vertical walls of which make an oblique angle with each other and with the railroad, the latter running through the quarry a distance of about 300 feet.

On the extreme south-east end of the hill, at the point penetrated by the railroad cutting, the crystalline schists dip east 30° south—62°. Whereas the limestone strata as seen from the interior of the quarry are nearly horizontal, but exhibit a slight roll from north 10° west to south 10° east, about 4°.

The occurrence of calcareous slates and calcite at Seitzville, Glen Rock and Shrewsbury, on the lower part of this section line, is very instructive. Here the calcite is in many cases clearly interbedded in the chlorite schists; contains them within itself and is contained by them. That the position of these limestones in the series is below the York limestone, there can be scarcely a doubt.

Description of Section 3a.

This section follows a line south 34°30′ east from the Sprenkle ore opening, on the slope of the Pigeon hills, to Bachman Valley Junction, four and a half miles.

Commencing here, the line crosses the northern edge of the limestone belt with a dip of south 50° east—22°. About one-fourth of a mile further on, the outcrop from the Sprenkle quarry crosses the line dipping north 35° west—48°.

Immediately succeeding this dip, there occurs the line of the Sprenkle ore. This limestone is overlaid by an argillite resembling those found among the schists, although argillites are not distinctive of any particular age or formation. A "bastard limestone" is found in the ore shaft on the Sprenkle property, of about a foot in thickness. It will be seen from the special map that the belt of York limestone in the vicinity of the Sprenkle mine has reached its narrowest point and cannot be more than a quarter of a mile in breadth, as it is here very much encroached upon by the Pigeon hills. The only outcrops on which are based the theory of its continuity are the exposure in this quarry, and that in the bluff at Oil creek, where the crystalline rocks show in a railroad cutting in contact with it. The limestone dips south 30° east—69°, and the schists east 30° south —78°. The latter show also two planes of cleavage, viz: east—60°, and west 10° south—45° respectively. Continuing the line past the Sprenkle ore line and across the creek about three-quarters of a mile, schists occur dipping south 32° east—60°. The recorded dips are too few to enable the structure to be drawn in with even a show of probability.

The last dip is in schists north 45° west—60° about half a mile below the position of Bachman Valley Junction.

The most interesting part of this section consists in the line of uncomformable contact between slates and limestones at the north-western extremity.

There *appears* to be a general north-west dip in the ore shaft nearest the railroad, and if so, this may be caused by a roll of measures which carries the limestone exposed to the north-west above the line of present surface, allowing the lower ferriferous slates to appear.

There seems to be clearly non-conformability between the limestone and slate in the railroad cutting since the difference between the two both in dip and strike is considerable.

Description of Section 4.

This section runs south 35° east, from a point on the Abbotstown road five and two-third miles west of north of Hanover to one-half mile south-west of the Hofacker bank; ten miles. The Mesozoic sandstone dips normally here north 20° west—20°.

A few hundred feet on the line from the New Red sandstone the projections of various limestone quarries give conflicting dips. (Henry Meyers', south 25° west—40°; Henry Bittinger's, south 20° west—36°, south—60°, and south 10° east—40°; Samuel Wolf's, south 45° west—75°, and another, south 45° east—40°).

From this it is apparent that this part of the line of contact between the formations, like that west and north of York, was the seat of much disturbance. The prevailing dip on the line is south-east, and moderate, for a little over one and one-half miles, where a dip of south 45° east—60°, seems to mark the ascending limb of a folded synclinal, which sinks again half a mile further on, with a dip of south 45° west—28°. For the next one and one-third miles no dips are available; then the strike of limestone east 23° north (with south-east dip) occurs, immediately before the projection of the Kauffman and Eckert ore belt on this line, and the succession of schists. This ore dips, with its including decayed slates, south 32° east—50°.

The succeeding structure of the schists seems to be a synclinal trough one and five-eighths miles in breadth, to the north limb of the succeeding anticlinal, but it cannot be reproduced from the facts now at hand.

A third of a mile on the line south-east of the Kauffman and Eckert ore range, yellowish slates occur dipping south 45° east—55°. But few dips were obtained in the remaining five and one-tenth miles of the section.

At 6,500 feet from the crossing of the Eckert and Kauffman ore occurs the limestone mixed with chloritic schists at Allison's mill, with a dip of about south 75°.

Two thousand feet further on the line, is the projection of the Hofacker ore, with a dip of south 70° east—50°, and 600 feet further on the line, the hydro-mica slates from Benade's quarry dipping south 30° east—76°.

The significance of the occurrence of this limestone has been mentioned before. In appearance it is of a dull earthy appearance and buff color, and both contains, and is contained within, the schists.

Description of Section 4a.

This section passes south 35° east through the town of Hanover. One and a-half miles north by west of the town a dip in limestone gives south 40° east—24°. Immediately west of the town a dyke of trap occurs, which seems to strike a little west of north.

A little more than half a mile south 35° east from the centre of the town, on this line, an outcrop of limestone occurs, dipping south 23° east, strength uncertain.

Three-fourths of a mile further on the line, the Forney-Delone ore occurs, dipping about south-east—35°. The next dip, five-eighths of a mile distant, is of a yellowish slate, south 45° east--55°.

From this point there is an hiatus for a little more than three and one-eighth miles, when the slates dip vertically. All these slates are more or less chloritic.

Nearly three-fourths of a mile from this, they dip north 55° west—72°; and, one-fourth mile further on, are vertical with nearly the same strike (*i. e.* north 45° east).

The last dip, obtained a little less than a mile from the last locality, is in chlorite slates and with the same dip.

The covering of soil is too great to permit the structure to be accurately ascertained.

The trap reported at the commencement of this section is in all probability continuous with a dyke which occurs one mile east of Union mills, and again the same distance west of Frizzeltown, and again about a mile east of Uniontown, Carroll county, Maryland. The course would be about south southwest, and its distance from Hanover, at the last mentioned place, about sixteen miles.

Description of Section 5.

This short section passes south 37°30′ east, through Littlestown, Adams county.

One and one-eighth miles north 37°30′ west of the centre of the town, the New Red sandstone dips west 15° north, 30°.

Passing south-eastwardly over half a mile of similar outcrops, limestone appears dipping south--30°. A dyke of trap here intersects the line followed by another limestone exposure of south--30°. The dyke strikes about north 20° east. This limestone, five-eighths of a mile further south-east, and near the centre of the town, is succeeded by sandy slates dipping south 35° east--60°. A little less thas three-fourths of a mile in continuation of this section is an exposure of slate dipping south 25° east— 60°.

While the number of the flexures is not indicated in the section, the latter supports by its evidence: first, the non-conformability of the Mesozoic sandstone, which lies on the upturned edges of the York limestone; and second, the non-conformability of the limestone and crystalline schists, the latter both by direction and strength of dip.

Description of Section 5a.

This short sub-section which it was intended at first to merge into section 5, will illustrate the condition of the series of New Red sandstone, limestone and schists at their contact. The line runs like that of section 5, north 37° 30′ west and south 37° 30′ east, and distant from it three-fourths of a mile. The first recorded dip on this line is one in the Mesozoic sandstone, one and five-eighths of a mile south-west of Littlestown. The dip is north 55° west--18°. A little less than half a mile from this, is the outcrop of slaty limestone, south 35° east--54°. Immediately following, are schists dipping east 30° south (the strength undetermined). One-fourth of a mile further on, the same schists appear dipping east 30° south.

The change of direction of dip of the limestone from that of the latter, indicates a non-conformability between them, as clearly as a marked difference of strength could do it.

CHAPTER III.

Remarks on some of the Rocks of the York District.

Hydro-Mica Slates and Schists.

In his section along the Susquehanna river from Wrightsville to Havre de Grace, H. D. Rogers conceives the altered Primal slates south of Wrightsville, to be succeeded by the Auroral limestone, "imbedding *talcose slate* with segregated quartz." These slates, which have received the name "talcose," very generally through this country in the earlier explorations, are of gray, brown or bluish color and exhibit under the magnifying glass, along with a heterogeneous and unresolved slaty matrix, a vast number of small glistening scales, usually curved and very minute. Sometimes these scales assume a size sufficient to give a coarse schistose character to the rock. Its effect on the sense of touch is unctuous, and the lustre is pearly. Under a low power of the microscope these properties do not vary.

A specimen of this slate from Summit cut, Peach Bottom railroad, (containing, however, a little more iron than usual,) was analyzed under the direction of Dr. Genth, by Mr. Alfred Pearce, and was as follows:

	Per cent.
Silicic oxide, - - - - -	53.00
Alumina, - - - - - -	33.84
Ferric oxide, - - - - -	7.05
Magnesia, - - - - - -	0.83
Lime, - - - - - -	0.55
Soda, - - - - - -	1.40
Potash, - - - - - -	2.50
Ignition, - - - - - -	1.85
Sum, - - - - - -	101.02
Excess, - - - - - - -	1.02

A fine grained argillitic variety of these schists from the neighborhood of Seven Valley station, (Smyser's station,) Northern Central railroad, under about 250 diameters and between crossed Nicols' prisms, revealed points of magnetic oxide surrounded by stains of ferric hydrate, scattered over a field made up in great part of small columnar fragments of an amphoterolite and minute scales and grains. Some of the latter exhibit a brilliant play of colors in polarized light, and are probably fragments of one of the micas. The entire mass seems to be covered by a maze of fine lines, indicating the edges of foliæ.

An analysis by Mr. John H. Campbell showed

	Per cent.
Silica,	56.50
Alumina,	25.82
Ferric oxide,	6.18
Magnesia,	2.63
Soda,	1.42
Potash,	2.83
Water,	3.75
Sum,	99.13
Undetermined and loss,	0.87
Total,	100.00

Both these analyses tend to support the view that the mineral or minerals which give the unctuous feel and pearly lustre to the schists belong to the Hisingerite group of the Margarophyllite section of hydrous silicates (Dana's system.) The somewhat higher percentage of ferric oxide, in that from Summit Cut, was due to local cause, and not to any change in the general constitution of the rock.

A series of analyses of "damourite bearing slates" (one from Peach Bottom, York county, and four from Lehigh county) is given on page 126 of Dr. Genth's preliminary report on the mineralogy of Pennsylvania for 1875. In comparing these latter results with those just given, it will be observed that the Lehigh county specimens contain less iron and soda, and more potash, than those given above, yet there is an undoubted resemblance between the two sets.

Chloritic Rock.

Next to the hydro-mica schists of this belt of rocks, the largest portion are made up of chloritic slates, which occur in every variety, and mixed with the others in all proportions. These slates occur in large masses at Baer's and Willet's farms below Littlestown; at Hofacker's mine, six and a half miles south-east of Hanover; and at many points on the line of the Northern Central railroad, and on the shore of the Susquehanna. At very many places it is found decayed into a soft clay slate, sometimes containing limonite, while its harder and more compact varieties are associated with pyrite and chalcopyrite, the former mineral lying within it in nests and strings of crystals, in which the individuals are of considerable size, (one-half inch to three-fourths of an inch.)

A specimen of this rock from Willet's farm adjoining Baer's, about four miles south by east of Littlestown, was analyzed by Dr. Genth, who says, in a note, "the purest contained 5.26 per cent of quartz, which were deducted, and the remainder gave."

	Per cent.	Ratio
Silicic oxide, - - -	22.46	11.66
Alumina, - - -	22.83	11.51
Ferric oxide, - - -	2.84	
Ferrous oxide, - -	35.70	10.40
Manganous oxide, - -	0.10	
Magnesia, - - -	6.11	
Water, - - - -	9.94	
	99.98	

He adds: "This is the most basic chlorite mineral, more so even than Thuringite, which it resembles."

The composition of this rock is interesting, not only on account of its basicity, but also because a proper knowledge of it is necessary to that of the formation of which under different appearances it constitutes so large a part. It resembles Thuringite in its percentage of silica more closely than it does any other mineral in the chloritoid group, but its alumina is too high, its ferric oxide too low, and both its sesquioxides, reckoned together, much below that of Thuringite.

The Help and Young ores are also in appearance compara tively compact chlorites, but already much altered by surface action, as the analysis shows.

They are impregnations and alterations of iron compounds in chloritic rocks which in some cases appear more or less gneissoid.

A large amount of the rock known as the Help ore was collected and forwarded to Harrisburg, where it was sampled and analyzed. The results will be found on another page. This ore contains (for equal weights of the rocks) 20 per cent less of the oxides of iron than the chloritic mineral just mentioned as occurring on Willet's farm. Besides Menaccanite it also contains Calcite and a small quantity of phosphorus.

As in Willet's rock so also in that of the Help & Young properties, the silicic oxide is not all combined, but exists in grains, and as a cement in places between the other minerals.

Ripidolite.

A specimen of ripidolite from an unknown locality in or near Peach Bottom township, York county, sent to the Survey by Mr. Keech, and marked No. 1 in the catalogue, exhibits a great number of plates of the mineral, much foliated and twisted. Under the microscope, and with an enlargement of 255 diameters, very minute contorted plates are seen in those parts of the field where the ordinary green ripidolite has been replaced by the rose colored variety (Kotschubeite (?)). Throughout the mass of the section are seen numerous very fine parallel lines, which are the edges of the fine plates exposed in grinding it. Grains of free quartz are also apparent.

Quartzite.

This rock is represented in York county by the rocks in place two miles north of Wrightsville; detached portions of rock on the summits of the range of hills from York to the Susquehanna; on Shunk's hill, just south of York; on the Pigeon hills, three miles north of Hanover, and on parts of the South mountain, (the latter, being its most prominent exhibition in Adams county.) It is a very fine grained and compact rock, exhibiting, generally, heavy bedding and joints of cleavage, the latter frequently rendering its structure difficult to represent, owing to the confusion arising from the numerous surface planes. Its prevailing color is flesh red or wine yellow, but it is sometimes beautifully white. An analysis of the Chiques rock made by Mr. M'Creath, shows:

	Per cent.
Silicic oxide, - - - - -	97.100
Ferric oxide, - - - - -	1.250
Alumina, - - - - - -	1.390
Lime, - - - - - -	0.179
Magnesia, - - - - - -	0.129
	100.148
Excess, - - - - -	0.148

The material which forms this rock is perhaps mainly derived from the very numerous and large veins of quartz which everywhere intersect the underlying slates.

A quartzite from Geo. Keller's farm, through which magnetic crystals were disseminated, is very compact, and the grains seem to have been so cemented together that even under a high power of the microscope, their lines of separation are not distinctly visible.

Patches of limonite in small and very irregular forms, intersect the mass of the rock, while in polarized light separate systems of concentric colored rings mark each original quartz fragment.

Quartz Slates.

Besides the pure quartzite just mentioned, are slates which contain more or less pure quartz.

A specimen taken from near Kneedler's mill, Peach Bottom railroad, was sliced and examined under the microscope, under an enlargement of 460 diameters.

It exhibits a clear matrix in which both angular breccia and rounded grains of quartz are imbedded, and besides this two separate silicates and small grains of magnetite.

One of these silicates lies in flat irregular plates in the colorless matrix. It is of light yellowish brown color, shows distinct cleavage in one direction and indistinct cleavage in another oblique to the first. It is dichoric.

The other silicate possesses vitreous lustre and elongate granular structure, resembling a string of beads laid down in haste. It has a deep, rich chestnut brown color, and resembles garnet.

Between crossed Nicols' prisms, the composite character of much of the slate that without them would be taken for the matrix is distinctly visible, the separate pieces resembling mosaic work. A partial analysis reveals:

	Per cent.
Water,	2.360
Potash,	1.050
Soda,	0.780

And a decided trace of lithia. Dr. Genth adds: " * * * taking the potash as belonging to damourite, we would have nearly nine per cent of it, (*i. e.* of the damourite,) and the soda to paragonite, there would be 9.6 per cent."

It seems best for the present at least, to omit giving here specific names to the minute constituents of these slates, for the reason that their character changes in the same specimen, when different portions are exposed to slightly different external conditions. All that can be safely predicated of them is, that they are hydro-micas, but whether margarodite, damourite, &c., it is often impossible to say. The separation of the potash from the soda, and consequent production of two of these hydro-mica species in the same rock, seems a somewhat bold assumption. Indeed, this mineral might be Euphyllite or (if part of the potassium be replaced by sodium) Œllacherite, or (in view of the lithia) Cookeite equally as well.

Until a sufficient quantity of these minute flakes of mica is separated under the microscope, to enable a chemical analysis to be made of them, it seems more judicious to give them the more general name of "hydro-mica."

Gneissoid.

A ferruginous gneissoid mica schist, containing magnetic grains sparsely distributed through it, occurs near Shrewsbury station, Northern Central railroad. It passes into chlorite slate both to the north and to the south. Three sections of this rock, under the microscope (400 diameters) reveal a rough and colorless matrix, in which are imbedded small plates of mica and grains of quartz, with irregularly shaped grains of magnetite, surrounding each of which is a cloud of brownish glass, apparently stained with ferric hydrate.

Limestones.

The limestones of this district are of several different kinds, (to judge by their outward appearance, for no systematic chemical investigation of them has been undertaken.) One kind is a dark blue, frequently slaty, variety, which is not seldom compact and tenacious. Its weathering is often unlike that of limestones generally, in that it presents compact rounded knobs to the eye instead of the fractured and honeycombed appearance which usually distinguishes this rock, where much exposed to atmospheric decay. This variety is usually characterized by seams and streaks of white crystalline limestone, and is sometimes capable of receiving a polish. Further, the dark color of the rock, whether or not due to particles of animal carbon, seems to have some connection with its history, for there are belts of country in which it is more generally observed, and lines over which the transition from the dark to the light limestone is abrupt.

Dolomitic Limestones.

A number of these limestones have been examined under various powers of the microscope, (up to 450 diameters,) but no certain indications of organic remains were observed.

A striped limestone, occurring one-half mile north-west of Wrightsville, was analyzed by Mr. L. de L. Moss, in Dr. Genth's laboratory, and found to contain:

	Per cent.	Per cent.	
Silicic oxide,	0.30		
Alumina,	2.07		
Ferrous oxide,	0.37		
Magnesia,	15.51		nearly.
Magnesium carbonate,	——	31.46	
Carbonic acid,	45.30		nearly.
Calcium carbonate,	——	66.79	
Lime,	37.44		
	100.99		
Both carbonates		98.25	
Impurities,		1.75	
		100.00	

This dolomite approaches most nearly in its composition a dolomite from Sorrento, analyzed by Abich, and placed by Dana among those whose molecular ratio of calcium carbonate to magnesium carbonate is approximatively 3 : 2.

An impure buff colored limestone, from Smyser's bank, analyzed by Mr. Salom, showed:

	Per cent.	Per cent.
Silicic oxide	12.15	
Alumina,	3.75	
Ferrous oxide,	1.17	
Magnesia,	15.54	
Magnesium carbonate,	——	32.63 nearly.
Carbonic acid,	38.70	
Calcium carbonate,	——	51.07 nearly.
Lime,	28.60	
Sum,	99.91	
Both carbonates,		83.700
Impurities,		16.300

In neither of these analyses is there carbonic acid enough to combine with all the lime and magnesia. Were it not that the ferrous oxide has been neglected in computing the relative amounts of the two carbonates, the deficiency of carbonic acid in the second of these would be still more conspicuous. But it is very likely that part of the lime and magnesia may be united to the alumina in the first case, and still more so that the impurities in the second may exist together in the form of some amphoterolite, together with free silica.

A dark blue limestone streaked with crystalline white limestone, containing calcite, from Feigley and Brillhart's (Kauffmann's) mine was partially analyzed. This rock was excessively slaty in appearance, in fact could hardly be distinguished from the hydro-mica slates which accompany the limestone in these valleys, when viewed upon a broad face.

The soluble portion (consisting principally of the carbonates of lime and magnesia) comprised 78.15 per cent, and the insoluble portion 21.85 per cent of the rock.

This insoluble portion consists as follows

	Per cent.
Silicic oxide,	62.50
Alumina	20.16
Ferric oxide,	4.17
Soda,	2.15
Potash,	2.59
Ignition,	4.87
Pyrite, &c.,	3.46

Dr. Genth adds:

"The soluble portion consists of about 80 per cent of carbonate of lime; about 8 per cent of carbonate of magnesia; 2 per cent carbonate of iron, and small quantities of silicic oxide, alumina, &c."

If, as there is some reason to believe, this limestone belongs to the rocks older than the Auroral, its smaller percentage of magnesian carbonate would be in accordance with the theory of Dr. Hunt, as to the laws of succession of these limestones, while the potash and soda would find a ready explanation in intercalated hydro-mica (damourite (?)) slate.

Four limestones were submitted to Mr. McCreath for partial analysis, as follows:

No. 1. From the bottom of McWilliams' slope one mile east of Dillsburg, York county.

No. 2. Opposite Allison's mill, near Xenia P. O., York county.

No. 3. From shaft No. 5, three-quarters of a mile east from Mont Alto furnace.

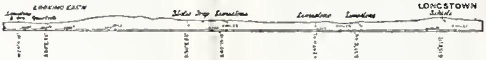
No. 4. Half mile south of Seitzland in cutting of Northern Central R. R.

	Per centage.			
	No. 1.	No. 2.	No. 3.	No. 4.
Calcicum Carbonate	73.18	62.35	77.89	93.87
Magnesium carbonate	4.37	6.32	2.83	0.96
Metallic iron	0.52	5.27	1.33	0.30
Insoluble silicious residue	21.50	20.06	15.89	4.30
Sum	99.57	94.00	97.94	99.43
Oxygen and Loss	0.43	6.00	2.06	6.57
Total	100	100	100	100

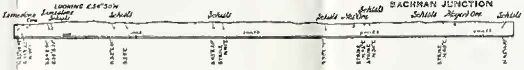
SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA.

GEOLOGICAL SECTIONS ACROSS YORK COUNTY, TO ILLUSTRATE REPORT OF PROGRESS IN 1874. BY PERSIFOR FRAZER JR.

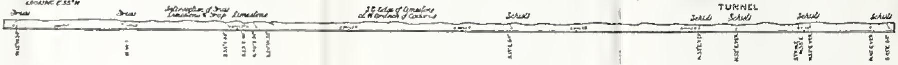
SECTION 1*a*. FROM SMYSER'S ORE OPENING TO LONGSTOWN.



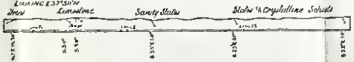
SECTION 3*a*. FROM SPRENKLE'S ORE OPENING TO BACHMAN JUNCTION.



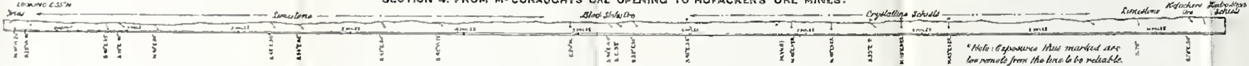
SECTION 2*b*. FROM LITTLE CONEWAGO CREEK TO FALKENSTEIN'S ORE BANK.


LOOKING E.35°N
Trias
Trias
Intercalation of Trias Limestone & Trap
Limestone
S.E. Edge of Limestone at N. Ordinate of Contours
Schists
Schists
TUNNEL
Schists
Schists
Schists

SECTION 5. THROUGH LITTLESTOWN.

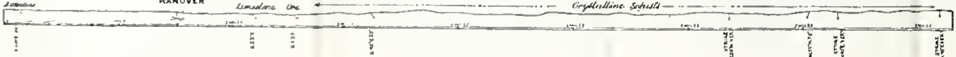


SECTION 4. FROM MᶜCONAUGHY'S ORE OPENING TO HOFACKER'S ORE MINES.

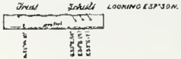


*Note: Exposures thus marked are too remote from the line to be reliable.

SECTION 4*a* THROUGH HANOVER.



SECTION 5*a*. S.W. OF LITTLESTOWN.



THE LOWER LINE OF EACH SECTION REPRESENTS MEAN TIDE LEVEL

CHAS. A. ASHBURNER, del.

No. 2 is reported by Mr. McCreath to contain a considerable percentage of Manganese.

No. 1 is a calcareous mass belonging in all probability to the base of the Mesozoic series. It is tinged green from the chloritic sands of the older schists on which it rests and is throughout decidedly crystalline.

The others, in all probability, belong to the old crystalline schist formation.

On comparing the analyses Nos. 2, 3, and 4, with those of the York limestone previously given, a striking difference in their respective percentages of magnesium carbonate will be observed. Thus:

Limestones.	Per cent. Magnesium carbonate.
Allison's Mill, - - - -	6.32
Feigley's Bank limestone, - -	6.25
Shaft No. 5, Mount Alto, - -	2.83
Near Seitzland N. C. R. R., - -	0.96
York limestone in Wrightsville, -	31.46
From Smyser's Bank, - -	32.63

The first four seem to be clearly identified with the crystalline schists and the latter to represent the great limestone belt which crosses over from Lancaster, and is identifiable with that of the "great valley."

The close correspondence of the first two is especially interesting in view of the fact that they occur on the same general strike, though about twelve and a half miles apart. The Seitzland specimen is not very far from the middle of a line joining these two.

One point must be borne in mind in reading the results of the analysis of the Allison's mill limestone. The specimen obtained was an earthy rock which in places had crumbled into streaks of brick-red color where its ferrous carbonate had been decomposed. It was almost impossible to separate this impurity from the remainder, and it was not attempted.

The results, therefore, may be taken to represent a "bausch" analysis of an already partially altered rock.

It will scarcely be necessary to mention that this fact increases the iron of No. 2 abnormally.

Other varieties of limestone are: a buff-colored arenaceous rock, and a saccharoidal (frequently pinkish) limestone the latter generally in the vicinity of trap dykes.

CHERT.

A specimen of chert taken from Smyser's bank, about three and a half miles north north-east of York, exhibits under the microscope vermiform markings of an exceedingly fine-grained matrix in which are imbedded minute columns of a colored mineral resembling hornblende and fine opaque specks which are possibly magnetic oxide. The main mass is of quartz in a state of indefinitely small subdivision.

An analysis of this rock by Mr. John H. Campbell, under the direction of Dr. Genth gives:

	Per cent.
Silica, - - - -	92.85
Alumina, - - - -	3.90
Ferric Oxide, - - -	trace.
Magnesia, - - - -	1.35
Water, - - - -	1.25
Sum, - - - -	99.35
Loss, - - -	0.65
Total, - -	100.00

There are occasional patches visible in the field of the microscope which resemble the iron stain around the magnetic grains in many traps.

ROCKS.

Asbestiform.

An asbestus of short fibre occurs near Harman's blacksmith shop, Warrington township, York county, in coarse-grained granitic syenite (?) The feldspar of this rock seemed to be pegmatolite and occasionally fine specimens of pyramidal quartz one-eighth to one-third of an inch in height, appear among the other constituents. The hornblende (?) is dark green and split up into fine fibres, sometimes an inch in length which are frequently leached white and converted into stellate bunches of asbestus.*

A similar rock is seen about a mile from Mr. D. Altland's house.*

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*This rock will be more closely investigated in the report for 1875.

A chloritic mineral (Prasilite ?) near S. Hess's house in Springfield township, York county, is decomposed into fine fibres like those of true asbestus.

Near Glatz's ferry, Hellam township, York county, is a whitish sandy mass, showing in some cases fibrous structure, and also probably derived from the weathering of a similar rock.

CLAYS.

A sandy kaolinized slate from near Glatz's ferry, shows under the microscope in an ill-defined matrix stained in places with oxide of iron, hexagonal plates and small prisms of quartz associated together in bunches.

The analysis by Mr. Pedro G. Salom, and a partial one by Mr. John H. Campbell showed:

	Salom.	Campbell.
Silica, - -	79.70	79.65
Alumina, - -	12.38	11.56
Ferric Oxide, -	1.57	1.59
Magnesia, - -	1.26	1.06
Soda, - - -	0.21	*
Potash, - - -	1.41	*
Water, - - -	3.10	3.25
Sum, - -	99.63	97.11
Undertermined and loss,	.37	2.89
Total, -	100.00	100.00

It is well known that the sodium and calcium feldspars are more decomposable than the potassium feldspars; and if this be generally true of silicates of the former elements as compared with potassium silicate, in whatever form the potash may have been combined in the minerals, which by their decomposition gave rise to the clay, analyses of these residues can throw very little light on the true character of the minerals from which they were derived.

ON THE TRAPS OF THE MESOZOIC SANDSTONE IN YORK AND ADAMS COUNTIES, PENNSYLVANIA.

Chemical Properties.

All igneous rocks consist principally of mixtures of some kind of feldspar (or Nepheline or Leucite) with pyroxene, hornblende, mica or quartz, and generally with some magnetite and other subordinate minerals. All these again may be divided into those poor in Silica or Basic, or those rich in Silica or Acidic.*

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* Not determined.

The average compositions of these two kinds of igneous rocks are:

	BASIC.		ACIDIC.	
	Per cent.	Average.	Per cent.	Average.
Silica, -	45–60	52	55–80	67
Alumina, -	10–25	17	10–15	12
Ferrous oxide, Ferric oxide,	1–25	13	1–15	8
Lime, -	1–15	8	0–8	4
Magnesia, -	1–12	7	0–4	2
Potash, -	1–9	5	1–11	6
Soda, - -	1–7	4	2–8	5
Water, -	0–4	2	0–6	3

Taking these ideal average percentages of the constituent compounds of these two classes of rocks, throwing them into a more convenient form and neglecting small fractions, we have:

BASIC.

	Per cent.	Oxygen.	Oxygen ratio.
Silicon - - -	24.96	27.0	27
Aluminum, - -	9.00	8.0	10
Iron from Fe_2O_3 say, -	4.5	2.0	
Iron from FeO say, - -	5.0	1.5	10
Calcium, - - -	5.7	2.3	
Magnesium, - - -	4.3	2.7	
Potassium, - - -	4.1	0.8	
Sodium, - - - -	2.9	1.0	
Hydrogen, - - -	0.2	1.8	
Total oxygen, -		47.1	

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* Rocks Classified and Described, by D. v. Cotta. Translated by H. Lawrence. London. Longmans, Green & Co., 1866.

Of course it is understood that these figures represent no combinations of elements actually possible, and that the ratio of the Oxygen of the Silica to that of the protoxide and sesquioxide bases is only approximative to that of a mixture of minerals representing a mean of the highest and lowest percentages of those elements which are more commonly found in Basic igneous rocks.

The same remark applies equally to the next following class:

ACIDIC.

	Per cent.	Oxygen.	Oxygen ratio.
Silicon,	32.16	34.84	34.84
Aluminum,	6.38	5.62	6.82
Iron from Fe_2O_3 say,	2.80	1.20	
Iron from FeO, say,	3.08	0.92	9.67
Calcium,	2.86	1.14	
Magnesium,	1.22	0.88	
Potassium,	3.24	2.76	
Sodium,	3.70	1.30	
Hydrogen.	0.33	2.67	
Oxygen.		51.33	

Bunsen's* classes were as follows:

	Pyroxenic.	Trachytic.
Silica,	48.47	76.67
Alumina, Ferric oxide,	30.16	14.23
Lime,	11.87	1.44
Magnesia,	6.89	0.28
Soda,	1.96	3.20
Potash,	0.65	4.18
Total,	100.00	100.00

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* Pogg. Ann., 1851, Vol. LXXXIII.

Bringing them into the same form as the above we have:

PYROXENIC.

	Per cent.	Oxygen.	Oxygen ratio.
Silicon, - - -	23.26	25.21	25.21
Aluminum (say 15 p.c. Al_2O_3),	7.95	7.05	11.60
Iron (say 15.16 p.c. Fe_2O_3),	10.61	4.55	
Calcium, - - -	8.47	3.40	6.69
Magnesium, - -	4.22	2.67	
Sodium, - - -	1.45	0.51	
Potassium, - -	0.54	0.11	
Oxygen, - - -		43.50	
Total acid and basic radicals, -	56.48		

TRACHYTIC.

	Per cent.	Oxygen.	Oxygen ratio.
Silicon, - - -	36.80	39.87	39.87
Aluminum (say 7 p.c. Al_2O_3)	3.71	3.28	5.45
Iron (say 7.23 Fe_2O_3), -	5.06	2.17	
Calcium, - - -	1.03	0.41	2.06
Magnesium, - -	0.11	0.11	
Sodium, - - -	2.37	0.83	
Potassium, - -	3.47	0.71	
Oxygen, - - -		47.38	
Total acid and basic radicals, -	52.61		

In the Journal of Science and Arts, Vol. IX, March, 1875, is a paper by Mr. Geo. W. Hawes, on the Trap Rocks of the Connecticut Valley, in which a number of closely accordant analyses of Dolerites are given, the specimen being selected from various localities in the Mesozoic Sandstone Belt of that State.

A Dolerite taken from a dyke known as West Rock, and standing west of New Haven, gave to Mr. Hawes the following results, which have been embodied in the form of the preceding hypothetical compositions.

ANALYSIS I, OF WEST ROCK.

	Per cent.	Oxygen.	Oxygen ratio.
Silicon,	24.86	26.94	27.02
Phosphorus,	0.06	0.08	
Aluminum.	7.55	6.65	7.72
Iron (from Fe_2O_3),	2.48	1.07	
Iron (from FeO),	6.36	1.90	8.58
Manganese (from MnO),	0.32	0.10	
Calcium,	7.58	3.00	
Magnesium,	4.67	2.96	
Sodium,	1.59	0.56	
Potassium,	0.32	0.06	
Ignition,	0.63		
Oxygen,		43.32	
Acid and basic radicals,	56.42		

On comparing this analysis with the hypothetical composition of Cotta's Basic Igneous Rock, it will be observed that the Silicon (including under this head the small per cent. of P. present in West Rock), is almost the same in both, as also is the percentage of radicals in the protoxide bases, while the per cent. of Oxygen of both protoxide and sesquioxides, and the per cent. of the radicals of the sesquioxide bases are somewhat less in the actual, than in the hypothetical analysis.

In tabular form the proportions would stand as follows:

	HYPOTHETICAL BASIC.	
	Igneous Rock.	West Rock.
Silicon,	24.96	24.92
Oxygen,	27.00	27.02
Aluminum and Iron (from peroxide),	13.50	10.03
Oxygen,	10.00	7.72
Radicals of protoxide bases,	22.20	20.84
Oxygen,	10.00	8.58

A mean of 40 analyses of Labradorite recorded in Dana's Mineralogy, is as follows:

	Per cent.
Silica,	53.09
Alumina,	27.96
Ferric oxide,	1.33
Magnesia,	0.93
Lime,	10.88
Soda,	4.09
Potash,	1.08
Water,	0.84
Total,	99.39

Or in the simple form:

	Per cent.	Oxygen.	Oxygen ratio.
Silicon,	25.48	27.61	12.61
Aluminum,	14.73	12.96	13.36
Iron (from Fe_2O_3),	0.93	0.40	
Magnesium,	0.24	0.15	5.26
Calcium,	7.77	3.11	
Sodium,	3.03	1.06	
Potassium,	0.98	0.19	
Hydrogen,	0.09	3.75	

Mr. Hawes extracted enough crystals of pyroxene from one specimen of Connecticut trap to enable him to determine its constitution.

It bears the nearest resemblance to an Augite of the Rhone, analyzed by Klaproth:

	Si.	Al.	Fe.	Mn.	Ca.	Mg.	Ignition Alkalies and Loss.	Total.
Connecticut pyroxene.....	24.34	1.88	11.90	0.63	9.53	8.34	2.65	56.62
Oxygen..................	26.37	1.76	3.40	0.18	3.82	5.29		40.82
Augite (Rhone*)..........	24.96	3.06	8.48	0.19	1.00	7.80	4.23	54.49
Oxygen..................	27.04	2.70	2.54	0.06	4.00	4.95		41.29

* Dana's Min., p. 218, II. 7.

Assuming the pyroxene analyzed by Mr. Hawes to represent that constituting part of these traps, and assuming furthermore, the above average of 40 analyses of Labradorite as constituting the remaining part, we have the following compartive table, which is calculated by comparing the sum of the percentages of each element of the two minerals with double the percentage of the same element in West Rock.

PER CENT.

Elements.	Labradorite.	Augite.	West Rock.		
			Double Equivalent.	Deficient.	In Excess.
Si.	25.48	24.34	49.72	0.10	——
P.	——	——	0.12		0.12
Al_2^{vi}	14.78	1.88	15.10	1.51	——
Fe_2^{vi}	0.93	——	4.96	——	4.03
Fe'' & Mn''	——	12.53	13.36	——	0.83
Ca.	7.77	9.53	15.16	2.14	——
Mg.	0.24	8.34	9.34	——	0.76
Na.	3.03	1.65 (?)	3.18	1.50 (?)	——
K.	0.98	1.00 (?)	0.64	1.34 (?)	——

Of the constituents necessary to form a mixture of one molecule of each of the above mentioned minerals, there are in West Rock:

CHEMICAL UNITS.

Elements.	Deficient.	In Excess.
Al_2^{vi}	0.165	——
Fe_2^{vi}	——	0.216
Fe'' & Mn''	——	0.030
Ca.	0.107	——
Mg.	——	0.063
Na.	0.065	——
K.	0.034	——
Sum.	0.371	0.309
Si.	0.014	——
P.	——	0.011

Supposing the basic radicals in excess to replace those deficient, there are wanting 0.062 (= 0.28 p. c.), and of the acid radicals 0.003 units (= 0.018 p. c.) to fulfill the theoretical requirements.

Or, to throw this into a rough practical form susceptible of easy comparison:

Double Equivalent of Constituents of West Rock.				
Si. (P. &c.)	24.92×2		25.48 24.34	1 molecule Labradorite. 1 " Augite.
	=	49.82	49.82	
Al_2^{vi} &c.	10.03×2		15.66 1.88	1 molecule Labradorite. 1 " Augite.
	=	20.06	17.54	
Dyad and Monad Basic Radicals,	20.84×2		11.80 30.40	1 molecule Labradorite. 1 " Augite.
	=	41.68	42.20	

A specimen of Dolerite was taken from Beeler's farm, two miles south-west of York, York county, Pa., and submitted to Dr. F. A. Genth, for analysis, which is as follows:

PER CENT.

				Oxygen.	
Silicic acid	52.53	Silicon	24.51	28.02	28.24
Phosphoric acid	0.15	Phosphorus	0.06	0.10	
Titanic acid	0.32	Titanium	0.19	0.12	—
Alumina	14.35	Aluminum	7.65	6.70	8.48
Ferric oxide	5.93	Iron (from Fe_2O_3)	4.15	1.78	
Ferrous oxide	5.45	Iron (from FeO)	4.23	1.21	—
Manganous oxide	trace	Manganese	—	—	—
Magnesia	7.99	Magnesium	4.79	3.20	—
Lime	10.27	Calcium	7.33	2.94	8.00
Lithia	faintest trace	Lithium	—	—	
Soda	1.87	Sodium	1.38	0.49	
Potash	0.92	Potassium	0.76	0.16	—
Copper	trace	Copper	—	—	—
Sulphur	0.08	Sulphur	0.08	—	—
Ignition	1.23				
Total	101.04				
Excess	104				

These constituents in chemical units give:

Silicon,	3.500	3.515
Titanium,	0.015	
Phosphorus,	trace	
Aluminum,	0.834	2.050
Iron from sesquioxide)	0.222	
Iron from protoxide),	0.150	
Magnesium	0.399	
Calcium,	0.366	
Sodium,	0.060	
Potassium,	0.019	
Difference,		1.465

DOLERITE FROM BEELER'S.

Total units in rock,	11.130
Chemical units of Si. and Ti.,	3.515
" " of basic radicals,	2.050
Excess of units of Silicon, &c.,	1.465

(*Neglecting Sulphur*).

	Chem. Units.
Total chemical units of oxygen,	5.565
Excess of units of acid over basic radicals (= units of saturating oxygen)	1.465
Linking oxygen,	4.100

= 32.80 p. c.
Saturating Oxygen = 11.72 p. c.

Hence the conclusion that 4 p. c. of this rock is Silicon combined as ortho-silicic acid, according to the formula $M'_4Si^{iv}O''_4$, and the remaining 20.51 per cent. exists in the form of the mono-meta acid, or as $M'_2Si^{iv}O''_3$.

The excess of the chemical units of Si. over those of the basic radicals, will also serve to explain the observation of free Silica in them, mentioned to me by Mr. Hawes in reference to those Ct. Traps, which have suffered partial alteration ; and verified in those from our own State.

It may be added that the reduction of the analysis of these rocks to a form which gives the measure of chemical force employed in the composition of their constituent minerals, and in a single unit, *i. e.*, the ratio of the percentage weight by the equivalence to the atomic weight seems a very convenient one to employ in discussing the questions here considered.

It is interesting to observe that while the analysis of the Connecticut Dolerite agrees very well with a mixture of one molecule of Labradorite to one of Pyroxene, that from Beeler's farm corresponds even more closely with a mixture of two molecules of Labradorite to one of Pyroxene. In this table the same analyses of Labradorite and Pyroxene are used as in the former case.*

	3 molecules of Beeler's dolerite.			
Si.	24.65×3		40.49 (24.7×2)	2 molecules of Labradorite.
			24.34	1 " Pyroxene.
	=	73.95	73.74	
Al_2^{vi} &c.,	11.81×3		32.40 (16.2×2)	2 molecules, Labradorite.
			1.88	1 molecule, Pyroxene.
	=	35.43	34.28	
Dyad and Monad Basic Radicals,	18.45×3		23.60 (11.8×2)	2 molecules, Labradorite.
			30.40	1 molecule, Pyroxene.
	=	55.35	54.00	

OPTICAL PROPERTIES.

Dolerite—coarsely granular—from Cemetery Hill, near Gettysburg, Adams. Co., Pa.

Contains Feldspar, Pyroxene and Magnetite, and some Hornblende and rarely Quartz. With a single Nicol's prism, the blades of Hornblende are fully dichroic. Both that and the feldspar are speckled and spotted,

Between two Nicol's prisms the Labradorite polarizes through blue, yellow and lilac; and the Quartz which is sparingly present, gives brilliant colors.

In a thick slice examined under the microscope the feldspar differs from that of the equally thick slices of other dolerites in being more transparent and "icy"-looking, resembling Adularia, while here and there are small grains of a transparent mineral giving the rainbow colors of quartz.

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* NOTE.—It will of course be understood that out of the residue of elements not considered in these general comparisons, many minerals not only *may* be, but actually *are* represented in the rock.

A Trap from Vincent's Spur, three miles south of Gettysburg, examined under a magnifying power of 268.6 diameters, and with a single Nicol prism, displayed broad transparent white crystals of labradorite and much fractured dull olive-green masses of pyroxene containing small and large black specks of magnetite.

Between two Nicol's prisms, the labradorite gives brilliant colors. Part of the pyroxene shows changes of color from pink to greenish but the larger portion shows such changes either very faintly or not at all.

This behavior is in all probability, due to a decomposition of the pyroxene to a chloritic mass.

A trap from two miles south of Gettysburg on the Taneytown road near Cassalt's house exhibits the labradorite and pyroxene in a fresh state the latter is much cleft and in places feebly dichroic while in many places rectangular slabs of hornblende (recognizable both from their prismatic angle and their perfect dichroism) protrude from behind the larger masses of pyroxene or lie separately among the feldspars.

A specimen from Granite Spur or Little Round Top, although not quite thin enough to examine with advantage presents the chief features of the preceding.

Some apatite is visible and one curled prism of Prochlorite.

A specimen from Round Top exhibits the same features with a single Nicol prism as the two preceding. In this slice there are no crystals which give the characteristic cleavage of hornblende, although the fragments exhibiting dichroism are quite numerous.

A Trap from the east side of Culp's hill, showed pyroxene and labradorite, together with much apatite and magnetite. Many fragments (some of them coarsely stellate) of a wine-yellow color showed perfect dichroism. No hornblende can be asserted with certainty.

Another specimen from the east side of Culp's Hill, shows a few fragmentary hornblende crystals, which show dichroism with a single Nicol. One of these also exhibits a cleavage angle of ± 124°. The iron stains are broadly spread out from the magnetite nuclei. Apatite is much less frequent than in the last. The planes of twinning of the labradorite are prominent.

Dolerite from Beeler's Farm, two Miles E. of York, fine grained.

This slice at 275 diameters and between Nicol's prisms, shows an agregate of irregular portions of crystals of pyroxene and Labradorite with the accompanying magnetite. The surfaces of the crystals are rough, but they do not seem to be so much affected by weathering as in that marked No. 3.

Dolerite (No. 3) from Beeler's Farm, two Miles W. of York.

The Labradorite and pyroxene of this specimen, under 275 diameters, appear in much the same condition as those of the slice from the Mumper dolerite. The blades of Labradorite are twinned and sometimes geniculated; the two individuals polarizing alternately light and brown.

Certain parts of this slice are very rich in a fine rod-like crystal apparently uniaxial which may be set down with safety as apatite. A very large number of these little crystals is distributed throughout the whole mass.

Dolerite from Mumper Shaft, one Mile E. of Dillsburg, York Co., Pa.

The thin section (magnified 56.8 diameters) and with one-eighth inch aperture, exhibits blades of Labradorite very finely and regularly striated, mixed together with yellowish green masses of pyroxene irregularly cleft and stippled on the surface like fish roe and containing magnetite, around which is to be seen a brownish-yellow stain due to its partial conversion into ferric hydrate. With appertures of half inch, quarter inch, and three-sixteenths, the same appearances are manifest, but not so clearly.

With the parabolic reflector the fragments of magnetite assume a partially metallic lustre.

With one Nicol's prism there is a faint appearance of dichroism in some isolated spots of some of the pyroxene crystals but in general there is no change.

Between two Nicol's prisms the pyroxene changes from green to pink (sometimes giving a transient spot of deep purple), and the irregular rifts in its mass are more plainly visible.

The Labradorite changes abruptly along the planes of twinning to light brown and pale greenish-blue from white. The staiation is very apparent and polarization is usually complementary in two or three sections of the single blade.

The magnetite of course remains unchanged.

Between Nicol's prisms and magnified 275 diameters, the outlines of the constituent crystals of this rock are very sharp, and the pyroxene in particular shows very brilliant shades of purple and green.

The cleavage is quite apparent, and the whole rock seems but little altered.

Dolerite from Logan's Shaft, one Mile E. of Dillsburg.

This slice resembles the others but is less decomposed and compounded of finer crystals than they. It exhibits Labradorite, pyroxene and magnetite, besides acicular crystals which appear to be apatite.

Under 275 diameters the Labradorite and pyroxene have a rough appearance, as if covered with little bubbles, due perhaps, to incipient decomposition. A number of small needle-like apatite crystals are scattered through the mass.

The greater part of the Labradorite (which is twinned as usual) lacks sharpness of outline.

EXPLANATION OF THE PLATES.

PLATE I.

FIG. 1. This photograph was among the first made with an $\frac{8}{10}$ microscopic objective. A portion of the edge of the section was included in the field in order that the portion represented might be more easily recognized and studied under the table-microscope.

The enlargement is very nearly 34 diameters. The original is a dolerite (No. 3) containing pyroxene (*a*), magnetite (*b*), plagioclase (labradorite) (*c*), and some scattered needles of apatite (*d*).

The previous description of the dolerite No. 3 from Beeler's farm applies to this specimen.

Fig. 2. The negative of this print was made in polarized light and is another portion of Fig. 1, Pl. III.

The object is a specimen of dolerite from Beeler's farm marked No. 4.

The rock is seen to be a confused mass of crystal fragments consisting of labradorite (*a*), pyroxene (*b*), and magnetite (*c*).

Plate II.

Fig. 1. This is a dolerite from Logan's, a shaft contiguous to the Mumper shaft, one mile E. of Dillsburg. Besides exhibiting the relations of the light-colored slabs of labradorite to each other, and the pyroxene which forms a matrix for them, there are two distinct apatite crystals reproduced in the print.

a. Labradorite.
b. Pyroxene.
c. Apatite.
Central black spot, Magnetite.

Fig. 2. Thin section of a dolerite from a shaft on Mumper's property about one mile N. Dillsburg. The dyke of which this is a section cuts the ore bed at a short distance beneath the surface.

In this print there is a labradorite of unusual size, in which is imbedded a small mass (of pyroxene) (?) which appears black in this light. The striation of other labradorite crystals and the outlines of the magnetite crystals may be noticed.
unusually sharp.

a. Labradorite.
b. Pyroxene.
c. Magnetite.

Plate III.

The figures in this plate were photographs of the same object, but under different conditions of polarized light. Figs. 1 to 5 inclusive, were photographed in five different positions of the analyzer. A peculiar crystal of pyroxene which exhibits a kernel differing in color from the body of the crystal was made the guide. The purpose of these experiments was to see

Pl. I.

Fig. 1.

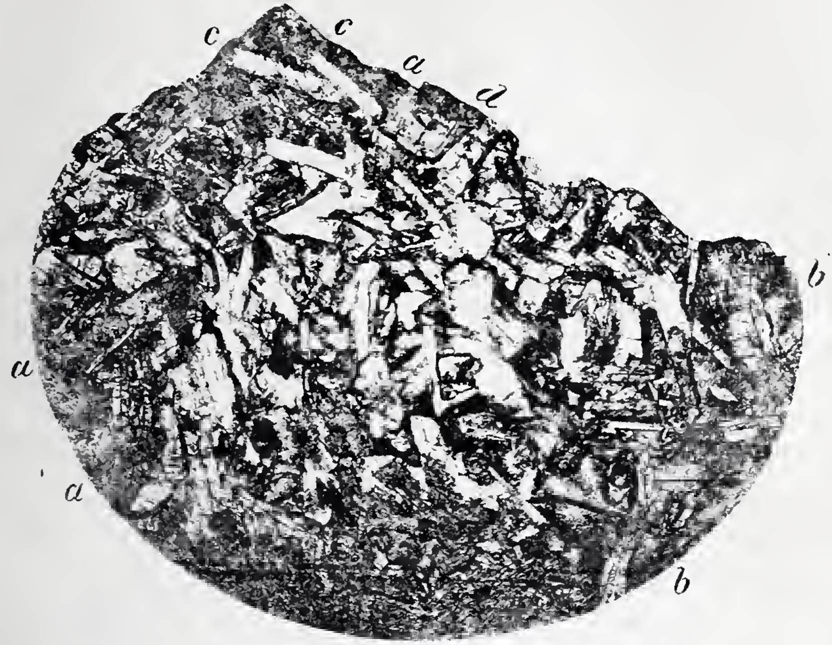

Fig. 2.

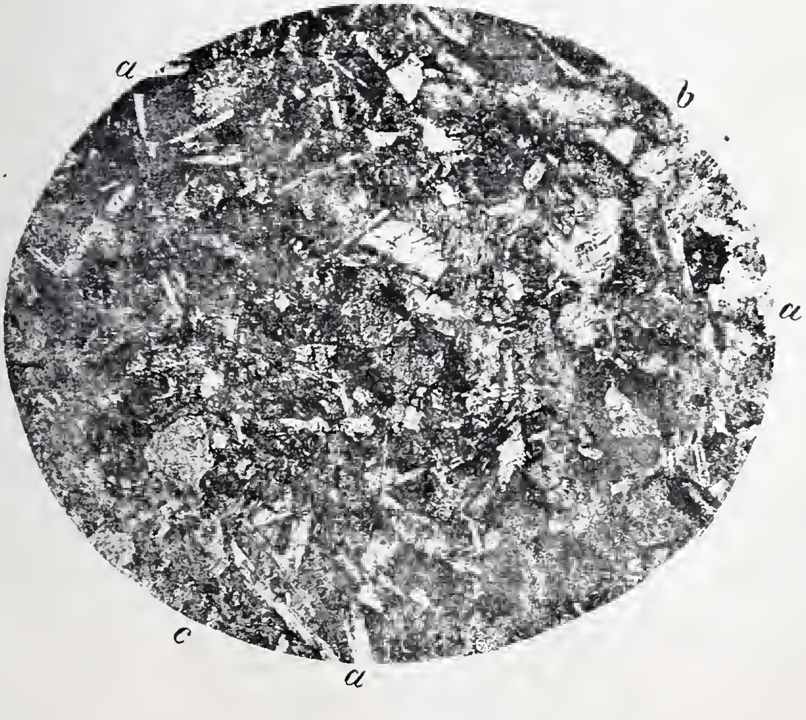

PHOTO-ZINCOGRAPH by F. A. WENDEROTH & CO., 1323 Chestnut Street, Philada.

Pl. II.

Fig. 1.

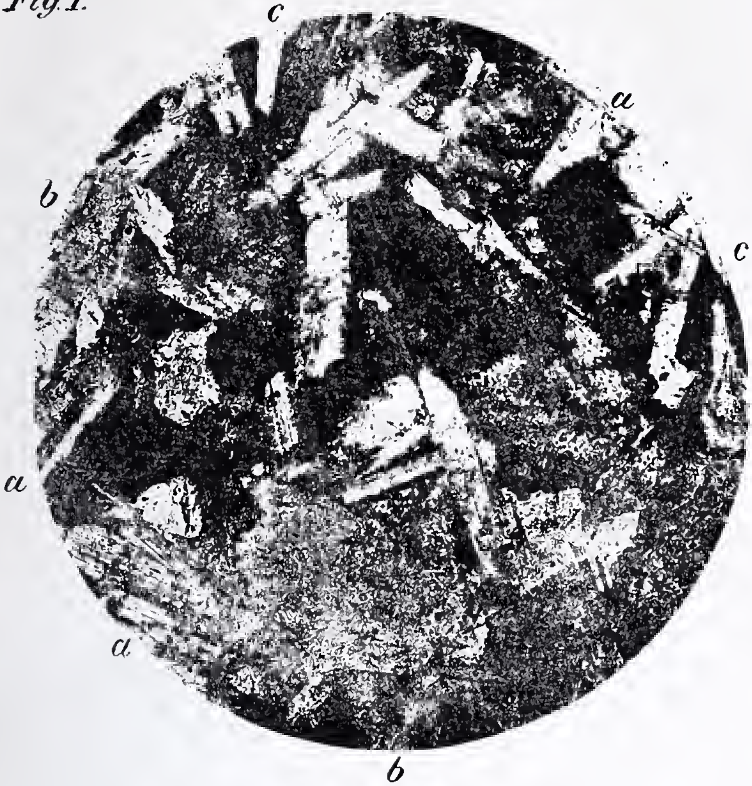

Fig. 2.

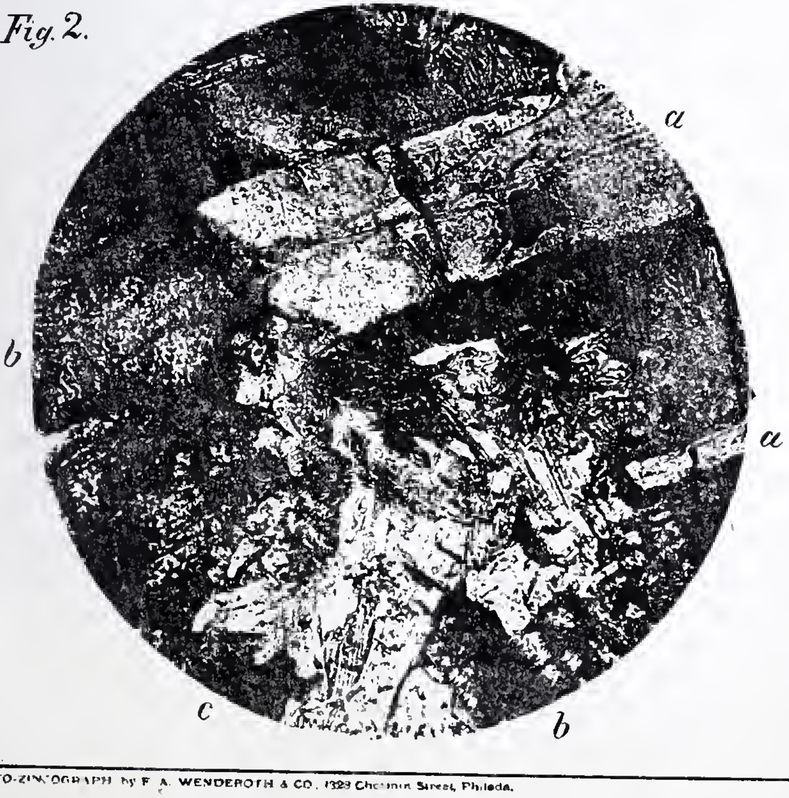

PHOTO-ZINCOGRAPH by F. A. WENDEROTH & CO., 1328 Chestnut Street, Philada.

Pl. III.

Fig. 1.

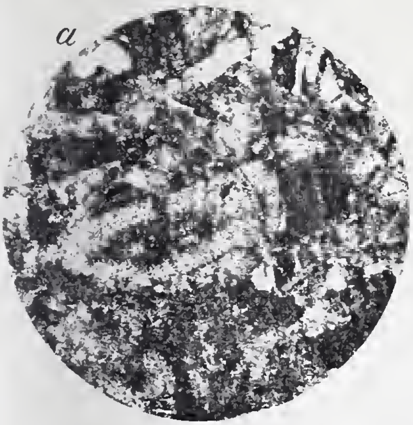

Fig. 2.

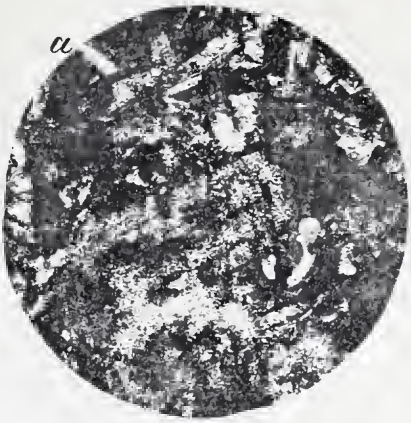

Fig. 3.

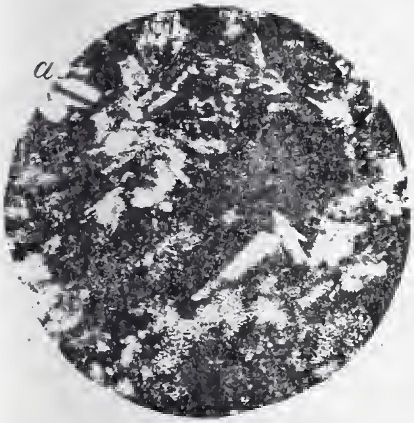

Fig. 4.

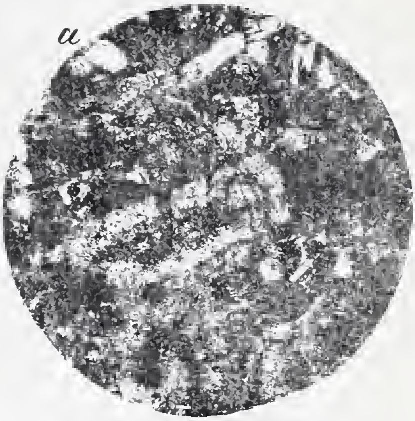

Fig. 5.

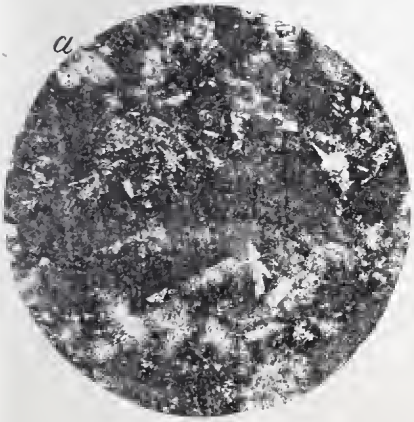

Fig. 6.

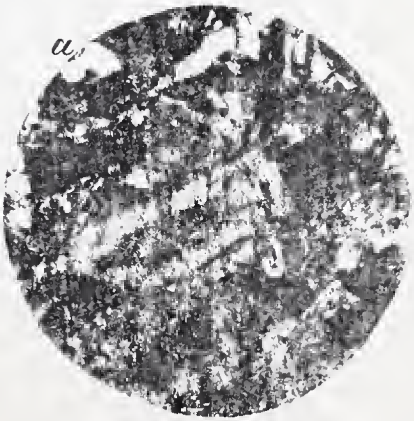

PHOTO-ZINCOGRAPH by F. A. WENDEROTH & CO 1328 Chestnut Street, Philada.

whether means could not be discovered to discriminate between the effects of anactinic light and opacity, by the camera alone. The object was a thin section of a dolerite from Beeler's farm, two miles W. of York, marked No. 4.

Fig. 1. This pyroxene appears of a light color and with a dark core, which in turn contains an irregularly formed light-colored axis. The boundary between this crystal and the magnetite at its right hand extremity is sharply defined; and its separation from a neighboring fragment just below its lower edge is also evident.

Fig. 2. In this photograph polarizer and analyzer are in the same phase. The main crystal is still light-colored, but there is less definition about the middle part of its dark nucleus, a light band extending nearly across it at this place. The pyroxene lying below its lower edge, which was dark in Fig. 1, has now become light, and the line of division between the two is nearly obliterated, except at one point where a small magnetite appears in relief against the light background. The angle of the analyzer was not determined.

In Fig. 3, the main crystal has become almost entirely black with a light core. The upper end now blends with the magnetite alongside of it, and the pyroxene on the lower side has become sensibly darker, but still leaves the small crystal of magnetite apparent. The angle of the analyzer was not determined.

In Fig. 4, with an angle of ± 135° from the first position, the appearance is nearly the same as in Fig. 1; and in Fig. 5 as in Fig. 3.

In Fig. 6, which was taken in the same position of the analyzer as Fig. 4, a new condition was introduced, viz.: a thin plate of selenite was interposed over the slide and between polarizer and analyzer. The effect is a general resemblance to Figs. 1, 2 and 4.

CHAPTER IV.

General Remarks on the Geology, etc.

The district, including the middle limonite belt of York county, may be generally stated to be an area reaching from the Susquehanna river, on the north-east, to the Maryland line below Littlestown, a distance of 40 miles south-west, and from the margin of the New Red Sandstone, on the north-west, to Cabin Branch run on the river, and Shrewsbury station on the Northern Central railroad.

The greater number of the more valuable ores occur within the area colored on the old maps to indicate the Auroral limestone of Rogers, or No. II. They do not however appear to belong to this formation, but to that upon which it rests.

The measures do not preserve an uniform strike throughout the entire length of the county, but like all the formations in this part of the State incline towards the south as they approach Maryland, and to the east as they near the Susquehanna.

The one feature which seems to be most distinctly marked by the majority of the sections, is the unconformable contact of the York limestone with the crystalline schists.

This unconformable contact appears in sections 1a, 3, 3a, and 5a, in a manner sufficiently striking to decide the case in favor of this view of the structure. And although the testimony of sections 2, 2a, 4, and 4a, is not applicable to the question, what is known of them is not at all incompatible with this view. But the difficulty which arises here is, that the very section (No. 1) which was constructed with the greatest care, and which most abounds in dips, gives as the uppermost dip of the quartzite south 20° east—45°, and the closely following dip of the lower slates south—45°. Again the upper layers of these slates give south 15° east—55°, and the next succeeding dip in limestone south 10° east—50°. It is true that, in the first of these contacts, there is a difference in direction of dip between the exposures in the two formations which are nearest together of 20°, but the very next dip in the slates is south 10° east, which shows an abrupt local bend in the line of strike—a feature almost universally prevalent in this region. In the second case there is a difference of 5° in strike, and also of 5° in the angle of dip; neither of which singly, nor even both together, would iustify the assumption of non-conformability in a region whose rocks are everywhere twisted, and their strike lines crushed into scallops.

In view of the conglomerate limestone represented by a blue (the York) limestone enveloping pebbles of crystalline and white (lower) limestone mentioned in the description of section 1, the locality of change in intensity of dip in the limestone itself, about one thousand feet south of the contact with slates, (north of Wrightsville) viz: from south 10° east—55°, to south 10° east—80°, is the more probable location of unconformable contact, if such there be on this line. But the immediate return to south 10° east—55°, and other facts relating to this hypothesis (all carefully considered) forbade this interpretation in the drawing. This section is drawn as nearly as may be in conformity with the observed phenomena, as are all the other sections; and while the manner in which they may agree is more than once hinted at, it is not pretended that the last word has been said in regard to these complicated questions in this preliminary report, nor has it been deemed necessary to omit or modify either of two observations which, as yet, may seem inconsistent with each other.

At the southern boundary of the main body of the York limestone, the unconformability of the latter with the slates is not inconsistent with the facts set forth by any section line.

One natural interpretation of this unconformable contact of the limestone and slates, is the existence of a long fault extending from the meeting of the mesozoic sandstone, limestone, and older slates just below Littlestown, at least to the Susquehanna river just below Wrightsville, and probably beyond into Lancaster county. A circumstance which seems to favor such an hypothesis is the very remarkable straightness of the line of contact, and the associated unvarying change of dip in passing south from limestone to slate.

Drawing a line from the south end of Littlestown, east 29° north twenty-nine miles, to a point a little less than a mile south-east of Widow Fritz's ore bank, we pass uniformly between the outcrops of slate and limestone which were noted in the lines run during the last season. Not only is there no encroachment of this line on either measures, but it lies almost wholly in a narrow belt where *no dip was obtainable, and no outcrop of rock discernible;* although both are recorded with tolerable frequency, both to the north and to the south of this line.

From this point (one mile south-east of Fritz's) there appears to be a curvature of the line towards the east, which causes it to emerge on the Susquehanna river at the lock just below the Columbia dam, after running for eight miles about east 15° north.

This is an hypothesis which seems necessary to account for the phenomena observable in the section along the Susquehanna river, and also for the *straightness* of the long lines of non-conformable contact. As for the non-conformability itself of the two formations, it seems to be established independently of the existence of faults.

The larger portion of the rocks of York county consists of crystalline slates and schists which usually dip at high angles to the horizon, very nearly surround the limestone basin, and exhibit many variations between their extreme south-easterly outcrops and the base of the South Mountain, which is made up of them.

The inquiry as to the contemporaneity of these schists with the limestone called by Rogers "Auroral," involves two questions which are not satisfactorily answered by the structure of Section 1. First, are two limestones of different ages confounded under the name Auroral? Second, if so, are they conformable the one to the other, thus representing progressive growth of one formation during gradual subsidence of its bottom and altered conditions of the water composing the Paleozoic Ocean? These questions cannot be settled by reference to the apparent regularity of deposition of slates on quartzite, and limestone on slates in Section 1. In Detweiler's quarry, which is a little more than half a mile north of the Columbia bridge, there exists a conglomerate consisting of a blue limestone holding rounded pebbles of white limestone within it. The limestone exposed between this quarry and the northern edge of the belt is generally white and of a more earthy character than the average *York* limestone, in these respects resembling the limestone in Beeler's quarry, first met with in Section 2a; that in Smyser's bank, Benade's shaft, (Sprenkle's property) and the schist hill near the beginning of section 3, etc. The pebbles were, of course, fragments of an older limestone than that which enclosed them.

Certain localities may be specified, where a limestone possibly referable to this formation contains detached scales of these schists so thickly strewn over the laminæ of sedimentation that the appearance of a fragment of the rock viewed on a broad face, is almost sure to deceive the observer with the idea that he is regarding a chlorite or hydro-mica slate. Such a rock is mentioned by Rogers, as occurring on the Schuylkill, below Norristown. (Vol. I, p. 213.)

Many of the quarries in the Chester Valley, further southwest than the locality indicated above, are also iron mines, the ore being seen to dip regularly and conformably with the limestone beds and between them.

In York county, there is a limestone quarry between the Feigley and Brillhart ore banks, which accurately answers the description in Rogers, and another outcrop of it is found actually in these banks themselves and among the ore.

As a gangue, the slates seem to bear two different relations to the ores. The latter occur in the forms of magnetic crystals, varying in size from the minutest specks visible under a powerful lens to individuals, one-eight inch on the side, plates and scales of specular iron, and partially or not at all hydroxidized pyrite, with more or less impregnation by solution in the hard undecomposed and massive slates, as in the Strickhouser or York Iron Company's bank, Hofacker's, &c.

But the usual occurrence of the ore is as limonite, with varying quantities of magnetite and anhydrous peroxide of iron in the clays formed by the decomposition of these schists.

Though the quantity of the latter two kinds and more especially of the magnetite, is very small compared with the former; no one of these varieties will entirely elude a close search in any bank sufficiently opened to permit one. The magnetite being least subject to alteration is very often found in the bottom of the bank and along the rain courses which lead from any large pile of the limonite.

It is likely that the origin of the ore is to be sought partly in segregation and partly from alteration of iron minerals in situ. Of the former class are those glassy botryoidal and stalactitic ores, (Butcher's, Moser's banks, &c.,) whose pyramidal needles clearly show the position they held while in the course of formation. But other cases occur in which masses of ore of irregular shape and limited extent lie between the beds of the slates, and not only partake of the general dips of the latter, but share with them the most intricate and sudden convolutions, (*i. e.* D. Louck's bank about two miles north-east of York, an exposure on the Northern Central railroad, just below Glen Rock, the heading of Butcher's ore bank, &c. (—V. 75.)

It might be supposed that the micaceous and magnetic varieties should occur in largest proportion in the slates which had undergone least decomposition, and this seems to be the case.

Apart from the ore which they contain these crystalline schists seem to form the floor on which the York limestone lies, while another limestone seems to be bedded with them, (Allison's mill, (XIV, 75,) and probably Feigley's bank, etc.)

In Prof. H. D. Rogers' description of the section along the Susquehanna river, from Columbia to Chiques Rock, he represents a belt of slates as dividing the southern outcrop of limestone near the engine house. The first outcrop of limestone he represents as south south-east—50°, while these slates "dip 75° south or steeper than the strata do, nor do they coincide in strike with the bedding, but range more east and west." Here is shown a variation of 22½° of strike and 25° in inclination between limestone and slates; and two such sudden alterations within the space of 500 feet. But Mr. Rogers regarded the observed planes of slate dip as cleavage, while those of the limestone were assumed as representing the correct bedding.

When one observes how completely subject to the influences which produced this cleavage are the hard and rigid sandstones and quartzites (notably that of Chiques rock, but a short distance above the place we are considering,) and the complete shattering and shivering of the limestone in many localities as in the Chester valley described by Rogers; it is difficult to conceive how force could have been exerted on a calcareous formation like this in such a manner as to fill an included bed of slate full of cleavage planes, which are very oblique in *strike* to the direction of the wave axes of the former, and still to leave no record upon the limestone itself.

Such difficult questions are numerous also in York county. So far as can be generalized at all, the strike of the cleavage planes of the slates and limestones (very numerous in the latter) on the right bank of the Susquehanna, for a few miles above and below Wrightsville, seems to be nearly the same as that of the bedding.

An interesting exhibition of the contact of these slates with the limestone is seen in a cut on the Hanover Short Line railroad, close to the crossing by the York road at Oil Creek. Here the limestone dips south 30° east—69°, and the slates east 30° south—78°.

Another interesting case of contact is seen in a large quarry, on the same road, about one-half mile west of Spring Forge. The slates dip east 30° south—62°, and the limestone is almost horizontal, rolling gently in the quarry from south 10° east to north 10° west, with dips of not over 4°.

The limestones possess both physical and chemical differences. Both kinds appear to be dolomites with, as far as yet ascertained, little iron, but one is usually blue or mottled, and distinctly laminated or bedded, while the other is more earthy in appearance, usually of whitish or buff color, and stained with oxide of iron.

Amidst the York schists occur chloritic layers which crop out sometimes as a hard compact chlorite rock, in which the traces of lamination are almost obliterated, and containing frequently pyrite and sometimes chalcopyrite but little oxidized, and less frequently as a soft slaty rock pitted with casts of former crystals of pyrite, and often with fragments of this mineral more or less hydroxidized.

Occasionally are to be seen bands of hard quartzite, in some cases intersecting the dip of the slates in such a way as to lead, from the first glance, to the supposition that it represented the true bedding, but where the exposure is ample, generally merging by insensible degrees on its upper and lower surfaces into the same schistose mass in which it is found.

Veins of quartz (some of great breadth) intersect these rocks, and form headstones to mark the places where the schists are deeply buried in soil. Crypto-crystalline schists, and argillites also, occur at frequent intervals among them.

Origin of the York and Adams limonites or brown hematite iron ores.—In the first Report of the Geology of Pennsylvania, (Vol. I, p. 218,) it is stated of the Rathfon Ore Banks of Lancaster county, that in this, as in most of the other iron veins connected with the magnesian limestones, the position of the ore is precisely at the junction of the limestone and slate. "It is indeed only a very ferruginous variety of the metamorphosed slate regularly stratified and intercalated with it."

Again, "West of the Gantner Ore Diggings," * * "the ore lies in decomposed sandy talco-micaceous slate between the sandstone and an outcrop of limestone south of it." And just beyond, "The Conewango Ore Bank lies at the junction of the Auroral limestone and the talco-micaceous slates of the primal series." In another place, the section of this limestone at Strickler's run is given, commencing at the lowest member of the series:

7. Limestone (?.)
6. Bluish talcoid slate, 200 feet.
5. Limestone (?.)
4. Dark-blue slate, 20 feet.
3. Limestone, 15 feet.
2. Blue talcoid slate, 200 feet.
1. Limestone, 150 feet.

(Total 405+feet.)

Of the iron ores of York county, it is stated simply that a belt is traceable along the southern edge of the limestone towards Littlestown, but has been long neglected, owing probably to its containing a considerable portion of the oxide of manganese. All these statements agree in placing the limonites beneath the Auroral limestone. The ores which are entirely away from the limestone seem not to be mentioned at all.

The ores of York county are partly compact slate, more or less thickly sown with magnetic ore (Ilmenite?), micaceous iron and pyrite; partly limonites, either testaceous and brittle, or botryoidal and manganiferous; or concretionary mixed with much clay and other impurity; or soft and earthy.

The ores which have been most developed, and give fairest promise of future value, comprise the latter three classes, and formed the principal ranges studied by the party of the York and Adams district during the season of 1874.

The magnetic and specular ores which occur in the Mesozoic sandstone, in the northern parts of York and Adams counties, are not enumerated here. The first fact of importance with regard to these kinds, is that they never occur far from the "York" limestone,* but always on its edges, thus skirting the entire basin (when not overlain by the New Red Sandstone), and forming a line of ore wherever, within its limits, from folding and subsequent denudation, an edge of this limestone is exposed. 2d. They are *almost* always found in yellowish and bluish clay. 3d. Not only is each belt of ore made up of small pockets and nests lying with little regularity in the decomposed slates constituting the clay, but in some cases the belt itself is capricious, and appears to run out whenever the rock becomes less easily decomposable.

The source of this iron supply has been ascribed to the minute crystals of pyrite which undoubtedly permeate some horizons of the great Calcareous deposit, but their number and the porousness of the limestone as observed in connection with the ore, seem to bear no relation to the latter. It seems much more probable that the supply of iron was obtained from the pyrite crystals of the lower slates. Even the slates which are not so situated as to permit the percolation of water through them, exhibit a porous structure, the pores being filled with brown ochreous limonite; and this occurs to an unknown depth, and the slates seem to merge by imperceptible degrees in a direction normal to the plane of bedding, first into completely metasomatized pseudomorphs of limonite after pyrite (but still retaining the form of the latter); then, the same with a kernel of pyrite; then the pyrite itself, first with a shell, and then with a mere stain of ferric hydrate; and finally the same slates are revealed porphyritic from the pyrite, and not at all decomposed.

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* Auroral limestone of Rogers.

As to the origin of the iron in these limonite beds: is the iron derived from the percolation and solution of the pyrite disseminated through the more recent limestone beds; or does it come from the decomposed pyrite in the less recent slates? If the former hypothsis be the true one, we should expect to see an absence of limestone in the vicinity of the large deposits; for, granting for the moment that the limestone contain enough pyrites to account for the entire deposit, (a fact which at least admits of some question,) a percolation of water sufficient to oxidize the sulphur of these pyrite crystals and carry away enough iron to produce the beds, would entirely honey-comb and finally, both by solution and attrition, dissipate the pyritiferous belts of limestone. But in and near some of the largest limonite beds we find the limestone scarcely weathered, and in few cases, if any, it is rendered ferruginous or even stained to any great degree by chalybeate waters. Indeed, the absence of the familiar iron stain from the calcareous member of this formation is so marked, that this point of difference from the adjacent members of the series cannot fail to arrest attention.

Again the uniformity of the occurrence of these limonite deposits on the skirts of the basin and the lower edge of the elevated limestones and their absence elsewhere, cannot but be the result of the law of their formation. Were these deposits derived from the pyrite desseminated through the limestone there would be no way of explaining the adherence to this rule when the strata are highly inclined or vertical, except by supposing that the ferruginous solution from the limestone found its way across the decomposing slate beds in a direction perpendicular to their planes of lamination—an hypothesis opposed to all experience. But this would not account for the absence of iron oxide on the remaining edges of the limestone itself, for even if we could accept the flow of the waters through the bedding we should be at a loss to account for the absence of that flow along the planes of bedding. It is objected in short to the hypothesis which would derive the limonite beds from the desseminated pyrite in the overlying limestone. 1st. That the position of the beds seems not to affect the extent of the deposit, there is no appearance of wasting in the limestone commensurate with the effect produced, and not even the staining from chalybeate waters which must have accompanied such a genesis. 2d. Very similar deposits are found in horizons far below the limestone, as at Hofacker's, the Hanover Junction railroad, range, etc.

The facts which are most intractable, assuming the former hypothesis, might have been predicted on the latter. A large portion of the slates underlying the York limestones are pyritiferous. A specimen taken from a point on the Peach Bottom railroad, about five miles south-east of York was selected. A slab of this slate $3\frac{1}{2} \times 2\frac{1}{2} \times \frac{3}{8}$ inches was examined to ascertain the number of prints of pyrite crystals which it contained. On the area of the surface $3\frac{1}{2} \times 2\frac{1}{2} = 8.75$ sq. inches there were counted 350 such pits visible to the naked eye.

A micrometric measurement of a large number of these pits gave all intermediate dimensions between $\frac{1}{16}$ and $\frac{1}{48}$ of an inch. Assuming the mean of the cubes of these dimensions or 0.000213 cubic inch as the average size of a crystal, we have 40 such crystals in one square inch, occupying 0.00851 cubic inch. In the specimen examined which was $\frac{3}{8}$ inch thick, there were nine layers distinctly visible to the naked eye. Each layer was therefore $\frac{1}{24}$ inch in thickness and supposing only 0.00852 cubic inch of pyrite in each square inch of laminæ, we have $0.00850 \times 24 \times 12 \times 5 = 12.27$ cubic inches of pyrite in every square inch of area and 5 feet of thickness of these slates. One cubic inch of pyrite weighs 126.1 grains. In the above thickness and area of these slates there are then 1547.25 grains, or in each square foot of the same thickness 222803.57 grains= 31.81lbs.

This would give us for every mile of outcrop and 1,000 feet of arch above the present surface the enormous sum of 168,009,600lbs.=75,004 tons of 2,240lbs. But the metallic iron in this mass of slates one mile in length and five feet in thickness, would weigh 47729.7 tons, and supposing it to be also oxidized, the anhydrous oxide would weigh 68185.2 tons and as limonite 79691.5 tons.

Assuming $\frac{1}{4}$ of this to be washed into the soil and $\frac{3}{4}$ to be left as earthy iron ochre in the pits originally filled by pyrite in the slates still in place and only partially decomposed,—which lie in juxtaposition to the ore; then every outcrop of these slates one mile long and *one foot* deep has contributed about 20 tons to the deposits. But the entire mass of the rocks which were formerly above the present surface have been washed away, and with them their 47,730 tons of metallic iron, or their 79,691 tons of limonite (if all this iron was hydroxidized,) for every 1,000 feet of slope, five feet of thickness and one mile of outcrop. Added to the smaller contribution of the partially weathered slates at the surface, this gives the total of 79,711 tons of limonite per mile, which has been gradually carried down the dip and segregated among the clays. But these slates are of very great thickness—at least 100 times what has been assumed. Allowing, then, for all loss by transportation into the sea, and through breaks in the continuity of the clay beds to great depths under ground, and for combination with the silicates to form double salts, we still have more than enough to account for all the largest ore banks. About a quarter of a mile east of Kauffman's mine in the Dunkard Valley, one mile east of Logansville, there occurs a rock almost indistinguishable from the neighboring schists, but which contains 78.15 per cent. of soluble matter, of which about 62.52 per cent. is calcium carbonate, and nearly 6.25 per cent. magnesium carbonate. A similar occurrence of limestone on the Schuylkill is quoted elsewhere from Rogers' last report.

It seems probable that the limestone belongs to a lower horizon than the "York," perhaps to the same as the body of "impure limestone," near the York Furnace, on the south bank of Otter creek, 100 yards from the river. This limestone he describes as about two feet thick and enclosed between talc-slate, and adds: "It seems to be merely a layer of the talcose primal slate, and not a fold of the Auroral (York) limestone."

But even it the Feigley limestone be a part of the Auroral (York) it is not strange to find its lower layers mixed up with the debris from the schists upon which it was laid down.

A far stronger proof of its contemporaneous origin with the schists, is its occurrence on edge in the bank itself; and the question of greatest interest is what is the age of the schists?

In reference to the older limonite deposits of Lancaster county, it is said (Rogers, Vol. I, p. 183): "An interesting inquiry is here suggested as to what can have been the geological atmospheric condition which produced the remarkable percolation which carried down so large an amount of ore out of these ferruginous beds. Was it tepid rain charged with carbonic acid in an early Palæozoic period? Or could it have been a long filtration of surface waters such as now soak the earth? Or are we to surmise an action of internal steam issuing upwards through crevices in the strata in a period of crust movement and disturbance? I am inclined to the first conjecture."

Dr. Hunt, in his essay on metalliferous deposits (XII, Chem. and Geol. Essays, Boston, 1875, p. 229), says: "The question has been asked me—Where are the evidences of the organic material which was required to produce the vast beds of iron ore found in the ancient crystalline rocks? I answer that the organic matter was, in most cases, entirely consumed in producing these great results, and that it was the large proportion of iron diffused in the soils and waters of those early times which not only rendered possible the accumulation of such great beds of ore, but oxidized and destroyed the organic matter, which in later ages appear in coals, lignites, pyroschists and bitumens. Some of the carbon * * is, however, still preserved in the form of graphite," &c.

With reference to the Ferric Sulphide or pyrite, the same author ascribes its formation to the deoxidizing agency of decaying organic matters out of contact with air on soluble sulphate of lime and magnesia, giving rise, if carbonic acid be present, to Hydrogen Sulphide. The latter (or a soluble sulphide) precipitates Ferric Sulphide which, in some conditions not well understood, contains two equivalents of sulphur to one of iron, and constitutes iron pyrites. He adds that he has observed that the ferrous sulphide or proto-sulphide of iron in presence of a per-salt of iron loses one-half of its iron, the rest being converted to Ferric Sulphide.

It seems at least a possible explanation for this more prominent determination of limonite along the edge of limestone, that by the oxidation of the pyrites of the slates an equivalent of sulphuric acid in addition to that necessary to form Ferric

Sulphate has been produced. That this molecule of free sulphuric acid in its passage over the mica and chlorite slates has dissolved out part of their alkalies, especially soda. That this solution of sodium sulphate has mingled in the clay beds below with the solution of calcium bicarbonate, produced by the drainage of rain waters over the limestone beds, giving rise to sodium bicarbonate and calcium sulphate. That this sodium bicarbonate reacting on the Ferrous Sulphate has precipitated Hydro-Ferrous Carbonate which has been by oxidation rapidly converted to Ferric Hydrate, while the Ferric Sulphate has been immediately thrown down as hydrous oxide. This, be it repeated, is simply one of many possible explanations which may suggest themselves, to account for the observed fact that the limonite deposits in this region are more frequent and extensive in the neighborhood of limestone deposits than elsewhere.

But though the solutions from such basins may favor the deposition of this ore, they are not always necessary.

It has been incidentally stated that the proof of the fact that great limonite deposits may be independent of the influence of limestone, is the existence of such deposits in regions remote from it. There are many instances of this in York and Adams counties, as for example the Hofacker mine, the banks along the Hanover Junction railroad, and in short, those deposits which were denominated ores of the primal in the last Geological Survey of this State.

In fact, very few of the ore banks of York county, can be shown to bear any close relation to the "Auroral" series.

In section 4a, the Forney & Delone ore *seems* to overlie the York (Auroral) limestone, but the outcrops were so few and of such questionable importance, that the structure could not be drawn in.

But supposing the presence of limestone to have been an important, if not a necessary condition to the production of these limonites, we must suppose the latter to have been the results of segregation, and the clays become also necessary.

Slates are discovered which are ferriferous, and in all stages of decay, from the compact chlorite and hydro-mica slates of Hofacker's and the Strickhouser mine, through the decayed but still coherent slates so common along the base of the South Mountain, (with their strings and plates of included ore occupying space among the layers, and yet without any evidence of having disturbed them;) to the completely disintegrated masses which appear most frequently as adhesive clays of variegated colors and as soft as cheese. On comparing the deposits of the last two kinds of banks, the similar appearance of the ore as it follows the contortions of the slates is unmistakeable. Nor is it always impossible to prove by a careful examination of the planes of homogeneous material, (or color,) that the folds of the ore in the second case are due to the same cause. The theory of the alteration in situ of various iron minerals resulting in the formation of many of these limonites, advanced by C. U. Shepard many years ago, and ably discussed and accepted by Dr. T. S. Hunt, cannot be disregarded in seeking the causes which produced these limonites.*

[*In 1838, and independently of Prof. Shepard's observations, Dr. R. M. S. Jackson reported to Professor Rogers substantially the same conclusion from his study of the Limonite ore beds of Centre and Huntingdon counties. See Report of Progress, A, 1874, page 83—J. P. L.]

CATALOGUE *of Specimens collected in York and Adams counties during the season of* 1874, *as arranged and displayed in the Museum of the Survey at Harrisburg.*

NOTE.—The Roman numerals in the column of Remarks refers to the ore banks as numbered on the Special Map of this Report.

No. of specimen.	Character.	Lecality.	Remarks.
1......	Foliated schist; ripidolite...............	Somewhere in Peach Bottom township....	Presented by Mr. Keech, (C.E.)
2......	Hydro-mica schist......................	One-fourth mile south of New Freedom, in railroad cut.	Feebly magnetic.
3......	Gneissoid; mica slate....................	200 yards from bridge on railroad; one-third mile south of New Freedom.	
4......	"Silicon Steel ore;" compact chlorite slate containing magnetite and pyrite.	Young's farm south of Shrewsbury.	Ore like that of Help's, feebly magnetic (I).
5......	Hard dark limonite......................	Reilston's bank, four miles south-west of New Freedom.	(II.)
6......	Compact gneissoid mica slate...........	Shrewsbury station—200 yards east of Shrewsbury station.	
7......	Ferruginous gneissoid mica schist, containing magnetic grains.	Northern Central railway; one-half mile north of Shewsbury station.	
8	Gneissoid hydro-mica slate..............	Shrewsbury station.	
9......	Ferruginous gneissoid mica slate........	Help's brewery.	
10......	Ferruginous chlorite slate..............	Help's mines............................	(III.)
11......	"Silicon Steel ore" chloritic; slate containing magnetite, pyrite, and disseminated calcium carbonate.	One mile north of Shrewsbury station, Northern Central railway; Help's bank.	Magnetic.
12......	Limonite................................	Lamott's opening near the Maryland line.	(IV.)
13......	Limonite with Göthite..................	Keeny's ore bank, leased by the Lebanon company.	(V.)
14......	Limonite................................	Cameron opening, just over York county line, in Maryland.	(VI.)
15......	Limonite.	Cameron & Co.'s opening.	
16......	Chlorite slate..........................	Cameron's opening.	
17......	Ferruginous chlorite slate	Cameron & Co.'s opening.	
18......	Fine grained chlorite slate..............	Station 2,600, P. B. R. R., at Kneedler's mills.	Contains decided traces of limestone and free quartz.
19......	Quartz; slate...........................	Statien 2,600, at Kreidler's mills, P.B.R.R.	

20	Fine grained argillitic hydro-mica slate	Station 2,602, P. B. R. R., Wagner's mill.	
21	Argillaceous mica slate	Station 2,604, P. B. R. R., about half way between Wagner and Stiles' mills.	
22	Mica slate, with cavities of iron oxide	Station 2,605, P. B. R. R., between Wagner and Stiles' mills.	
23	Ferruginous mica slate	Station 2,607, P. B. R. R., picnic grounds.	
24	Clay slate	Station 2,608, P. B. R. R., cut at picnic grounds.	
25	Hydro-mica slate, with impressions of pyrite filled with iron oxide.	Station 2,610, near Neff's mill, P. B. R. R.	
26	Highly ferruginous mica slate	Station 2,612, P. B. R. R., Small's cut near Red Lion summit.	
27	Ferruginous mica slate	Station 2,612, P. B. R. R., in Small's cut near Red Lion summit.	
28	Highly ferruginous mica slate	Station 2,613, P. B. R. R., summit cut Red Lion.	
29	Ferruginous mica slate	Station 2,613, P. B. R. R., summit cut Red Lion.	
30	Mica slate	Station 2,613, P. B. R. R., summit cut Red Lion.	
31	Mica slate	Station 2,613, P. B. R. R., summit cut Red Lion.	
32	Chlorite slate	Station 2,614, P. B. R. R., near Red Lion summit.	
33	Hydro-mica slate	Station 2,623, P. B. R. R., near Seitz's mills.	
34	Hydro-mica slate	Station 2,630, P. B. R. R., below Kaufman's mill, rocky-hill side.	
35	Chloritic mica slate	Station 2,634, P. B. R. R., one-half mile below Stabley's mills.	
36	Sandy slate	Northern Central railway, one mile south of Seitzland.	
37	Compact chlorite slate	Glen Rock railroad-cutting, marked "B," on page 67, note book No. 5.	
38	Chlorite slate with quartz vein	Glen Rock railroad cutting, marked "A," on page 67, note book No. 5.	
39	Impure limonite	Reuben Burg's ore shaft, one-fourth mile east of Prospect.	Bank XX. Strongly magnetic.

CATALOGUE OF SPECIMENS—Continued.

No. of specimen.	Character.	Locality.	Remarks.
40	Slate highly impregnated with iron Limonite.	Margaretta furnace, from opening 300 yds. west of furnace.	Bank XXII.
41	Slate impregnated with iron	Margaretta furnace, from bank nearest stack.	
42	Mica slate, impregnated with iron	Margaretta furnace.	
43	Concretionary limonite with red hematite.	Margaretta furnace, opening nearest stack.	
44	Slaty limonite	Opening north-west of Margaretta furnace.	
45	Impure limonite	Margaretta furnace shaft, near stable yard of Mansion house.	
46	Limonite	J. Keller's, (Case & Co.'s mine) one mile east of Margaretta furnace.	Bank VIII.
47	Argillaceous mica slate, pitted with cavities filled with oxide of iron.	B. Raub's farm, north end of Dallastown.	
48	Pseudomorphs of hematite, after pyrite imbedded in slate.	B. Raub's farm, north end of Dallastown.	Crystals, three-fourth inch on a side.
49	Limonite	Old abandoned mine two miles east of Logansville. (Old P. Williams' bank.)	Bank X—Called variously old P. Williams or Gladfelter.
50	Limonite	Brilhart's mine, one mile east of Logansville.	Bank XI.
51	Limestone, with pinkish crystalline, do.	Between Feigley and Brilhart's pit, Dunkard valley, one mile east of Logansville.	
52	Slaty limestone	Between Feigley's and Brilharts bank, one and a half miles east of Logansville. Dip almost vertical. Reported limestone quarry.	Contains about 80 per cent. carbonate of lime.
53	Honey-combed limonite	Feigley's mine, Dunkard valley, one mile east of Logansville.	Bank XII.
54	Limonite	Feigley's bank, Dunkard valley, one mile east of Logansville.	
55	Clay limonite	Feigley's, one mile east of Logansville.	

56......	Limonite..................................	Hoffacker's old opening.................	Bank XIII, strongly magnetic.
57......	Limonite..................................	Hoffacker's bank, six miles east of Hanover, leased to Wrightsville company.	Strongly magnetic.
58......	Chlorite and quartz conglomerate with slates and pyrite.	Hoffacku's farm. Old opening.	
59......	Pyrites on chlorite slate..................	Hoffacker's farm. Old opening six miles south-east of Hanover.	
60......	Limonite, chlorite slate and pyrite.......	Hoffacker's bank, six miles south-east of Hanover.	
61......	Mica slate from mine.......................	Hoffacker's farm, Wrightsville Company's lease.	
62......	Chlorite slate.............................	Hoffacker's old opening.	
63......	Ferruginous slate, carrying pyrite........	Hoffacker's farm, old opening below house.	
64......	Chlorite slate.............................	Five miles south-east of Hanover, north of Baltimore pike.	No. XIV, Benade's shaft.
65......	Limonite..................................	Eli Bomgardner's farm, five and a half miles south-east of Hanover.	
66......	Concretionary limonite....................	D. Leber's shaft, four miles south-east of Wrightsville.	No. XV.
66a....	Calcareus slate, with pyrite accompanying limestone.	D. Leber's quarry, near Cabin Branch run.	
67......	Ferruginous clay...........................	J. Emig's bank, Kneisley's farm.........	No. XVII.
68......	Quartzite, with magnetite and some mica,	G. Keller's, one mile from Prospect, three and a half miles from Wrightsville.	No. XIX, strongly magnetic.
69......	Chlorite slate.............................	Geo. Keller's..............................	Strongly magnetic.
70......	Very fine grained chlorite slate...........	Geo. Keller's.	
71......	Impure, slaty, greenish limestone.........	Geo. Keller's.	
72......	Compact chlorite; fine grained and diffused in aquitite with quartzite.	Geo. Keller's..............................	Strongly magnetic.
73......	Limonite..................................	Small's bank, half a mile north of Margaretta furnace.	No. XXI.
74......	Brown and red hematite	Butcher's bank, six and a half miles east of York.	No. XXIV, Barcroft.
75......	Shelly limonite, with Göthite and black glossy (manganiferous ?) ore.	Butcher's bank, six and a half miles east of York.	
76......	Impure limonite, (manganiferous?)	Barley's ore bank, two and a half miles south of Campbell's station.	No. XXV, Barley (?)

CATALOGUE OF SPECIMENS—CONTINUED.

No. of specimen.	Character.	Locality.	Remarks.
77......	Limonite	Hengst's ore bank, two and a half miles south of Campbell's station, York and Wrightsville railroad.	No. XXVI.
78......	Impure limonite	G. Moser's new opening, one-fourth mile east by north of Ensminger's, five and a half miles from York.	No. XXVII.
79......	Limonite with clay......................	New opening, Ensminger's farm, five miles south-east of York.	No. XXVIII.
80......	Limonite.	Old opening, Ensminger's farm, five miles south-east of York.	No. XXVIII.
81......	Limonite, with yellow ochre and black glossy ore.	Moser's bank, near Wineka & Wright's, five miles from York.	No. XXIX.
82......	Shelly göthite, with ochre................	Old Moser bank, five miles south-east of York, specimen from scales.	No. XXX.
83......	Shelly göthite, with black glossy surface.	Old Moser bank, five miles south-east of York, specimen from scales.	
84......	Impure limonite.........................	Old Moser bank, near Wineka & Wright's, five miles south-east of York.	
85......	Ferruginous conglomerate	Found at old Moser's bank, five miles south-east of York.	
86......	Ferruginous conglomerate..............	G. Leader's farm, one-third of a mile east of intersection of Baltimore pike with East Codorus.	No. XXXI.
87......	Sandy chlorite slate......................	Geo. Leader's farm, one-third of a mile of intersection of Baltimore pike and East Codorus.	Magnetic.
88......	Chlorite slate............................	Leader's hill, second opening, between stations 160 and 161.	Magnetic.
89......	Pyrite hydro-mica slate	Leader's hill, station 160.	
90......	Chlorite slate, with impressions of pyrite.	Seventy-five feet south-east from John Ilye's farm, station 156.	

91	Impure limonite	S. Hess' farm, one mile west of Baltimore pike, one and a half miles south of New Paradise.	No. XXXII.
92	Hydro-mica slate	S. Hess' farm, one and a half miles south-west of Paradise.	
93	Limonite	Logansville road, Falkenstein's field, three-fourths of a mile east of Gladfelter's station.	No. XXXIII.
94	Mica slate, impregnated with iron	Geisselman's farm, one mile below Gladfelter's station, 2d shaft from road.	No. XXXVII.
95	Chlorite	Sthrumbach's farm, on road running west from Gladfelter's station.	
96	Hydro-mica slate	West of Seven Valley mill, on road to Gladfelter's station.	
97	Argillaceous limonite	Gladfelter's mine, near Smyser's station, Northern Central railway.	No. XXXVI.
98	Chlorite slate	Gladfelter's farm, on road running west from Gladfelter's station.	
99	Limonite	Smyser's station, Thomas Iron Company's shaft.	No. XXXVIII.
100	Slaty limestone, with imbedded crystals of pyrite.	John E. Zigler's slate quarry, three-fourths of a mile south-west of Hanover Junction	Like that from Feigley's bank.
101	Dendritic stain on argillite	J. Zigler's limestone quarry, near Hanover Junction, H. B. R. R.	Dendritic marking.
102	Argillite; roofing slate	Zigler's slate quarry, three-fourths of a mile south-west of Hanover Junction, opening No. 1.	
103	Slate, impregnated with iron	Walter's bank, near Hanover Junction	
104	Limonite	Musselman and Watt's bank	No. XL, David Crout.
105	Arenaceous; mica-slate carrying magnetite.	Beeler's opening in orchard, on range with Knotwell.	No. XLI, magnetic.
106	Sandy compact; chlorite slate	North-west one-fourth mile from J. Beeler's, near Stackhouser's station.	
107	Ferruginous; chlorite slate	Thomas Iron Co., just west of Strickhouser's station, Cold Spring bank.	No. XLVI (?)
108	Limonite; segregated in slate	Cold Spring bank.	
109	Argillacious; hydro-mica slate	Cold Spring bank, one-half mile from Cold Spring station, H. B. R. R.	No. XLVI.

CATALOGUE OF SPECIMENS—CONTINUED.

No. of specimen.	Character.	Locality.	Remarks.
110......	Chlorite slate, carrying pyrite and specular iron.	Knotwell's shaft, one and three-fourth miles from Hanover Junction.	No. XLII.
111......	Chlorite slate, carrying pyrite and specular iron.	Strickhouser's farm, leased to Knotwell.......	Strongly magnetic.
112......	Hydro-mica slate, impregnated with iron oxide,	Strickhouser's farm, leased to Knotwell.......	"Codorus ore," magnetic.
113......	Mica slate, carrying magnetite and pyrite......	New opening on Strickhouser's farm..........	No. XLIV, "Codorus ore." Feebly magnetic.
114......	Mica slate, carrying magnetite and pyrite......	York Iron Co.'s bank, on the hill above W. cut,	
115......	Limonite..................................	Bradbech's, one and a half miles from Jefferson,	
116......	Clay slate................................	Flickinger's ore shaft, one-half mile south-west of Jefferson, Jefferson and Hanover road.	
117......	Limonite..................................	Shueman's ore shaft, three-fourths of a mile south-west of Jefferson.	No. LII.
118......	Compact chlorite slate, carrying magnetite.....	Nes Hill, three-fourths of a mile south-west of Krauft's mill, near Bachman's Junction.	No. LIV, Strongly magnetic.
119......	Ferruginous argillite.........................	Station 2,488, P. B. R. R., near Small's mill.	
120......	Chloritic argillite............................	Station 2,489, P. B. R. R., near Small's mill.	
121......	Sandy mica slate............................	Station 2,490, P. B. R. R., near Small's mill.	
122......	Laminated quartz............................	Station 2,491, P. B. R. R., across creek from Small's mill.	
123......	Quartz, in slate..............................	Station 2,492, P. B. R. R., at Small's mill dam.	
124......	Fine grained chlorite slate....................	Station 2,497, P. B. R. R., near Small's mill dam.	
125......	Chloritic argillite............................	Station 2,497, P. B. R. R., at road crossing above paper mill dam.	
126......	Argillite....................................	Station 2,495, P. B. R. R., near Small's mill dam.	
127......	Calcareous mica schist.......................	Station 2,536, P. B. R. R., 19 miles from York.	
128......	Striped limestone............................	Kerr, Cook & Co.'s limestone quarry, one-half mile north-west of Wrightsville.	128a, calcareous slate
129......	White limestone.............................	Detweilor & Co.'s limestone quarry, Wrightsville.	129a, hydro-mica sl.
130......	Quartzite....................................	On York and Wrightsville pike, one mile west of Wrightsville.	130a, hydro-mica sl.
131......	Quartzite....................................	Bluff on Susquehanna river opposite Marietta,	131a, sandy mica sl.
132......	Kaolinized mica slate.........................	Glatz's ferry road, one-half mile from ferry.	

133	Chlorite slate; fine grained chlorite slate	River shore at Glatz's ferry, opposite Marietta,	
134	Quartz, conglomerate	Chimney rocks, 4 miles north-west of Wrightsville.	
135	Quartzite, conglomerate	Glatz's ferry road, one-half mile from D. Rudy's, nine miles from York.	
136	Compact limonite	Gohn's bank, two miles west of Wrightsville, one mile west of Y. & W. R. R.	
137	Concretion of limonite, red hematite and ochre,	Bahn's bank, one and a half miles from Glatz's ferry, and ten miles from York.	No. LXVII.
138	Quartzite	Near Rudy's ore bank, three miles west of Wrightsville, and three-fourths of a mile north of Y. & W. R. R.	Gohn's (?)
139	Limonite	Rudy's ore shaft, four miles west of Wrightsville, and three-fourths of a mile north of Y. & W. R. R.	No. LXX.
140	Quartzite	Ruby's bank, seven and a half miles north-east of York.	No. LXXI,
141	Limonite	Ruby's, next to Rudy's, eight miles north-east of York.	No. LXXI.
142	Ferruginous sandy slate	Grubb's bank, six miles north-west of Wrightsville.	Strongly magnetic.
143	Decomposed sandy slate	Grubb's bank, six miles north-west of Wrightsville.	No. CX, strongly magnetic.
144	Limonite	Keller's bank, five miles west of Wrightsville, one mile north of railroad.	No. LXXII.
145	Clay and limonite	Norse's bank, six miles north-east of York, and two miles north of railroad.	No. LXXV.
146	Limonite	Hiestand's bank, five and a half miles from York.	No. LXXIII.
147	Sandy hematite, with micaceous ore	Blessinger's bank, five miles north-east of York,	No. LXXIV, magnetic.
148	Limonite	L. Deitz's bank, four miles north-east of York	No. LXXVII.
149	Limonite	Deitz's bank, four miles north-east of York, and one-fourth mile from railroad.	No. LXXVIII.
150	Quartzite, conglomerate	Mount Zion church on top of ridge, five miles north-east of York.	
151	Spathic ore	Smyser's farm, Ashland Co.'s lease, four miles north of York.	
152	Chert	Smyser's bank, Small's lease, 4 miles north north-east of York.	

CATALOGUE OF SPECIMENS—Continued.

No. of specimen.	Character.	Locality.	Remarks.
153......	Limonite..	Smyser's bank, Small's lease, four miles north north-east of York.	No. CXII.
154......	Ferruginous sandy slate, with Göthite	Smyser's, four miles north-east of York.	
155......	Impure spathic ore............................	S. Smyser's farm, Ashland Co.'s lease, four miles north of York.	
156......	Limestone......................................	Smyser's farm, Ashland Co.'s lease, four miles north of York.	No. CXI.
157......	Limonite	Fritz's bank, four miles north-east of York...	No. LXXIX.
158......	Limonite	Heidelbaugh's opening, three miles east of north of York.	No. LXXX.
159......	Slate, impregnated with iron.....	Corr's bank, two miles north of York, on Vinegar ferry road.	No. LXXXI.
160......	Sandstone and slate	Corr's mine, two miles north of York.	
161......	Limonite	Ebert's mine, two miles north of York, on Vinegar ferry road.	No. LXXXI, magnetic.
162......	Limonite..	Ebert's ore bank, Benson & Cottrell's lease ...	No. LXXXI, strongly magnetic.
163......	Brown and red hematite, with micaceous iron ore.	On property at station 633, Diehl's.	
164......	Hydro-mica slate..............................	P. B. R. R., one and a half miles from York.	
165......	Slate, impregnated with iron..................	Louck's bank, Cottrell & Benson's lease, off Wrightsville pike.	No. CXVI.
166......	Slate, impregnated with iron..................	D. Louck's bank, one mile north of York, Opossumtown road.	
167......	Ferruginous sandy slate........................	Louck's farm, (near Hake's) one and a half miles north of York, Benson & Cottrell's lease.	
168......	Indurated clay	Louck's farm, (near Hake's) Benson & Cottrell's lease.	
169......	Clay..	Louck's farm, Benson & Cottrell's lease.	
170......	Argillaceous mica slate........................	Louck's farm, Benson & Cottrell's lease.	
171......	Red hematite....................................	Louck's farm, three miles north of York	No. CXVI.
172......	Red sandstone; (mesozoic).....................	Fork of Liverpool and Lewisberry roads.	
173......	Limestone.......................................	Fork of Old Liverpool and Lewisberry roads, (744a, V. 40.)	

174	Dark blue black limestone	Station 627, two miles north of York.	
175	Limestone from mouth of spring	George Ruth's.	
176	Hematite	Hake's farm; Schall's lease	No. CXIII.
177	Magnetic	Lightner's farm, one and a half miles north of York, on Harrisburg pike.	No. CXV, strongly magnetic.
178	Conglomerate red limestone. (Potomac marble?)	Emigsville.	
179	Pink S. S	Emigsville, from railroad cut.	
180	Blue laminated limestone	Emigsville.	
181	Buff and white laminated limestone, flaggy bedded.	One-half mile south-west of Emigsville.	
182	Micaceous, red sand stone	Five and a half miles west of York, near Emig's mills.	
183	Felspathic conglomerate	Five miles west of York, one mile north of Gettysburg pike.	
184	Honey-combed magnetite ore	Harman's farm, between Carlisle and Emig's mill roads.	Strongly magnetic.
185	Coarse new red sandstone	384 feet above G. Beeler's road on Carlisle road.	
186	Trias conglomerate, with slate pebbles	Beeler's cross road on Carlisle road, two miles from York.	
187	Coarse mesozoic conglomerate. (Potomac marble?)	300 feet above Beeler's road on Carlisle road.	
188	Blue limestone streaked with white	Intersection of Carlisle and Beeler's roads	Trias comes in here.
189	White limestone	Lime opening in field 400 feet from Carlisle road.	
190	Dark blue limestone	Station 178 j.	
191	Delerite	Beeler's farm.	
192	Crystalline limestone, with pink tint, (in contact with above.)	Station 178 h.	
193	Fine grained new red sandstone	Carlisle and Beeler's roads.	
194	Clay sandstone	Carlisle road near Harman and Beeler's, found in road.	Magnetic.
195	Honey-combed magnetic ore	Lewis Nyman, on A. Haman's property, north fork of Carlisle road.	
196	Limonite and red hematite	Harman's farm in fork of road from filled up shaft.	No. LXXXIII.
197	Red hematite	J. Eisenbach, on Emig's mill road.	
198	Dolomite	Road from Emig's mill road to Gettysburg pike.	
199	Arenaceous mica slate, intersected by quartz	Shunk's hill near summit, two miles from York.	
200	Quartz	Shunk's hill 200 feet from summit, three miles from York.	

CATALOGUE OF SPECIMENS—CONTINUED.

No. of specimen.	Character.	Locality,	Remarks.
201......	Crystal of pyrite, coated with limonite........	Road from Shunk's hill to Baltimore pike, two miles from York.	
202......	Quartzite, with imbedded crystals of pyrite altered on exterior to limonite.	One-fourth mile west of Baltimore pike, on road to Shunk's hill, two miles from York.	
203......	Quartzite..	100 yds. from Baltimore pike, two miles south of York.	
204......	Pink quartzite..................................	Station 30.	
205......	Milk quartz, with imbedded crystals..........	In road from Shunk's hill to Baltimore pike, two miles from York.	
206......	Milk quartz	One-fourth mile west on Baltimore pike, two miles from York.	
207......	Sandy slate.....................................	A cross road 200 yards from Baltimore pike, two miles south of York	
208......	Arenaceous chlorite slate......................	Two miles north-east of Brilhart's station, N. C. R. W.	
209......	Argillites..	Banks of Codorus, one mile north of York.	
210......	Dark blue limestone...........................	Bank of Codorus, one mile north of York.	
211......	Galena..	Frystown, east of York, Christian Miller's property, found in digging a well.	
212......	Galena..	Frystown.	
213......	Fine laminated slaty limestone...............	P. B. R. R., one and a half miles from York.	
214......	Blue limestone, carrying white calcite........	P. B. R. R., two and one-fourth miles east of York; D. & H. Shellenberger's quarry.	
215......	Dark blue limestone	P. B. R. R. two miles east of York.	
216......	Chlorite slate, with limestone	P. B. R. R., just south of Plank road.	
217......	Shaly clay slate................................	Smyser's bank, near toll gate, Gettysburg pike,	No. LXXXV, Eyester's.
218......	Ferruginous slate..............................	Smyser's bank, near toll gate, Gettysburg pike,	Magnetic.
219......	Argillaceous ore	Smyser's bank, near toll gate, Gettysburg pike,	(Kaufman.)
220......	Argillite slate..................................	Smyser's bank.	
221......	Corrugated red and brown mottled limestone,	Smyser's bank, two and three-fourths miles west of York, on the Gettysburg pike.	
222......	Slate, with disseminated magnetite	Kaufman's bank..................................	No. LXXXIV, specimen from "a"
223......	Ferruginous slate..............................	Kaufman's bank near station 77.	

224	Calcite	Sprenkle's limestone quarry, Hanover road near Wolf's tavern.	(sketch in note book No. 2.)
225	Highly crystalline limestone	Quarry on Hanover road near Wolf's tavern, five miles west of York.	
226	Red hematite wash ore	In field north of Wolf's tavern, five miles west of York.	
227	Impure slaty limonite	Opening south of school house on Hanover road; S. Emig.	
228	Ferruginous argillites	Opening in clover field south of school house, Hanover road; S. Emig.	No. LXXXVI.
229	Decomposed ferruginous slate	J. Roth, Jr., one and a half miles from Menges' north-west.	No. XCI.
230	Argillite	M. Myers, three-fourths of a mile west of Menges.	
231	Limonite	M. Myers' farm; new opening three-fourths of a mile west of Menges'.	No. LXXXIX.
232	Clay and limonite	Bollinger's	No. XCIV.
233	Ferruginous clay	Bollinger's, Hanover road.	
234	Brown and red earthy hematite	Bollinger's.	
235	Clay and limonite, wash ore from pit	Bollinger's; Kauffman's working.	
236	Limonite	Menges' bank, one and a half miles from Spring forge, Hanover road.	No. LXXXVIII.
237	Ferruginous slate	Jacob Myers' field, one-fourth mile north-east from Myers' mill.	
238	Limonite, with stalactites of the same ore, and Göthite.	Boyer's bank, flank of Pigeon hills	No. XCVI.
239	Quartzite	Abrupt hill by Myers' mill.	
249	Quartzose sandstone	Foot of Pigeon hills.	
241	Quartzite	Pigeon hill.	
242	Limonite	G. Forrey's field, near Boyer's bank	No. XCV, magnetic.
243	Argillaceous hematite	Moul's bank, foot of Pigeon hills	No. XCVIII.
244	Milk quartz	Foot of Pigeon hills; Porter's mine.	
245	Impure red and brown hematite	Moul's bank, foot of Pigeon hills	No. XCVIII.
246	Indurated clay, impregnated with iron oxide	Moul's bank, foot of Pigeon hills	
247	Compact limonite	Jesse Moul's bank, leased to Kauffman of Reading.	
248	Sandy limonite	Philip Moul's field	No. C.
249	Red oxide	Jesse Moul's bank	No. XCVIII.
250	Limonite, with black glossy ore	Geo. Bechtel's bank	No. XCIII.
251	Limonite	Hanover mine, Haldeman's ore, Pigeon hill range.	No. CII.

CATALOGUE OF SPECIMENS—Continued.

No. of specimen.	Character.	Locality.	Remarks.
252	Red hematite	Between Haldeman's and Kaufman's	No. CII.
253	Limonite	Miller's farm, Ashland bank	No. CVI.
254	Limonite	Miller's farm, Ashland bank	No. CVI.
255	Honey-combed limonite	Moul's farm, Ashland bank, opened by Gov. Porter.	No. CVII.
256	Limonite	Gitt's opening, three miles north of Hanover	No. CVIII.
257	Limonite	Thomas Iron Co.'s lease, one mile from Hanever.	No. LVII.
258	Sandy argillite	Delones's bank, one mile south of Hanover	No. LVII.
259	Limonite	Forney's bank, one mile south of Hanover	No. LVIII.
260	Ferruginous slate	John Bauman's bank, one mile south of Hanover.	
261	Ferruginous sandy slate	John Bauman's bank, one mile south of Hanover.	
262	Dark limonite, with pyrite	John Bauman's bank, one mile south of Hanover.	
263	Quartz	John Bauman's bank, one mile south of Hanover.	
264	Limonite	Henry Wirts' farm, one mile south of Hanover.	
265	Light blue, and white limestone	John Dubbs' quarry, one mile north of Hanover,	
266	Slaty limestone	Forrey's quarry, two and a half miles north of Hanover.	
267	Light blue limestone	Barnitz's quarry, two and three-fourth miles north by west of Hanover.	
268	Limestone	Barnitz's quarry, two and three-fourth miles north by west of Hanover.	
269	Granular speckled limestone	Samuel Myers' quarry, about two miles from Hanover.	
270	Light cream colored limestone	Dr. Hendricks' quarry, three and one-fourth miles north of Hanover.	
271	Light colored limestone, streaked with white	Dr. Hendricks' quarry No. 2, three and one-fourth miles north of Hanover.	

272......	Massive brecciated sandstone impregnated with oxide of iron.	Benade's opening, three and one-fourth miles north of Hanover.	
273......	Limonite......	Benade's opening, three and one-fourth miles north of Hanover.	No. CIX, M'Conaughy.
274......	Dark blue limestone......	Benade's opening, three and one-fouth miles north of Hanover.	
275......	White crystalline limestone......	Bittinger's quarry, three and one-fourth miles north of Hanover.	
276......	Limestone......	W. & H. Bittinger's quarry, three and three-fourth miles north of Hanover.	
277......	Limestone......	Wolf's quarry, four miles north of Hanover.	
278......	Ferruginous slate......	On Hanover and Carlisle pike, four and a half miles north of Hanover.	
279......	Sandy limonite......	Schwartz's farm, Eckert & Bro.'s lease, two miles south-west of Hanover on Littlestown road.	
280......	Slaty conglomerate......	Schwartz's farm, Eckert & Bro.'s lease, two miles south-west of Hanover.	No. LIX.
281......	Compact limonite......	S. Schwartz's bank, at Schwartz school house, two miles south-west on Hanover Littlestown road.	No. LX.
282......	Chlorite slate......	Henry Ramers' quarry, two miles south-west of Hanover. Littlestown road.	
283......	Argillaceous limonite......	Sol. Schwartz's bank, in middle of road leading to Littlestown, three miles from Hanover.	
284......	Dark compact limonite......	Boyer's bank, four and a half miles from Hanover.	No. LXI.
285......	Limonite......	Boyer and Schwartz's lease, about two miles east of Littlestown.	
286......	Limonite......	Boyer's bank, four and a half miles south-west of Hanover.	No. LXI.
287......	Mica slate......	G. Baer's farm, one-half mile from Maryland line.	
288......	Chlorite slate, with pyrite......	Baer's, four miles south-east of Littlestown.	
289......	Compact chlorite slate......	Willet's farm near Baers, one-half mile from Maryland line, four miles south-east of Littlestown.	
290......	Mica slate......	Krumrein's opening, three miles east of Littlestown.	No. LXIV

CATALOGUE OF SPECIMENS—CONTINUED.

No. of specimen.	Character.	Locality.	Remarks.
291......	Slate, impregnated with iron......................	Krumrein's opening, three miles east of Littlestown.	No. LXIII.
292......	Argillite	Krumrein's bank, three-fourths of a mile east of Killingers.	
293......	Mica slate.................................	Krumrein's opening, three-fourths of a mile east of Killinger's lower opening.	No. LXIV.
294......	Mica slate	Krumrein's opening, three-fourths of a mile east of Killinger's upper opening.	Strongly magnetic.
295......	Slates.....................	Early & Killinger, two and a half miles east of Littlestown, on Littlestown and Hanover road.	No. LXIV, Göthite, lepidokrokite, &c., in decomposed clay slate.
296......	Impure limonite, with geodes and stalactites of black glossy ore.	Early & Killinger.	
297......	Sandy decomposed slates.......................	Early & Killinger.	
298......	Slate, impregnated with iron oxide, carrying göthite.	Early & Killinger.	
299......	Slate, limonite and pyrite......................	Early & Killinger.	
300......	Limonite..................................	Early & Killinger.	
301......	Sandy limonite............................	Early & Killinger.	
302......	Conglomerate of slate and quartz..............	Early & Killinger.	
303......	Sandy impure slate, with white clay...........	Early & Killinger.	
304......	Shelly limonite, with lepidokrocite	Early & Killinger.	
305......	Argillite..................................	Early & Killinger.	
306......	Blue and white striped limestone	Solomon Mehring's farm, one and a half miles east of Littlestown.	
307......	Coarse ferruginous conglomerate...............	Commons near Littlestown, Schwartz & Boyer's lease, Clark's property.	No. LXI.
308......	Limonite	Clark's property, Schwartz & Boyer's lease, one and a half miles east of Littlestown.	No. LXVI.
309......	Coarse limonite, with vein of quartz.....	Lefever's bank, one and one-fourth miles north-east of Littlestown.	No. LXV.
310......	Limonite..................................	Lefever's bank, one and one-fourth mile north-east of Littlestown.	

311......	Sandy yellow ochre..........	Lefever's opening.	New Red.
312......	Conglomerate..........	Littlestown, one-fourth of a mile north of Centre square.	
313......	Dolerite..........	Five-eighths of a mile north of Littlestown, in field east of Gettysburg pike.	
314......	Blue limestone, streaked with white..........	Edward Gliffer's quarry, three-fourths of a mile north-west of Littlestown, north of Gettysburg turnpike.	
315......	Dolerite..........	One mile north of Littlestown, on Whitehall road.	
316......	Red sandstone..........	One mile north-west of Littlestown..........	
317......	Coarse conglomerate of mesozoic sandstone....	One mile south-west of Littlestown, north of Littlestown and Frederick Road.	
318......	Red sandstone..........	One mile south-west of Littlestown, north of Littlestown and Frederick Road.	
319......	Red sandstone..........	Two miles south-west of Littlestown, on Taneytown road.	
320......	Red sandstone..........	Two and a half miles south-west of Littlestown, near Maryland line.	
321......	Slaty conglomerate..........	Codorus hills, one mile from Maryland line.	
322......	Mesozoic sandstone stained with malachite....	Bridge over Fox run, on Bull road one-half mile south of Dover road.	
323......	Sandstone stained with malachite..........	Bull's road bridge on Fox run, one-half mile from Dover road.	
324......	Semi-anthracite fragments..........	B. Gross, on Liverpool road, three-fourths of a mile north of Liverpool, on Little Conewago.	
325......	Argillaceous Mesozoic, light colored limestone between sandstone and accompanying coal.	B. Gross, three-fourths of a mile north of Liverpool.	
326......	Mesozoic mud rock, with plates of impure coal,	B. Gross, on Liverpool road, on Little Conewago, (Spahn's farm adjoining Gross.)	
327......	Mesozoic limestone, between sandstones accompanying coal.	B. Gross, three-fourths of a mile north of Liverpool; Gross's hill.	
328......	Mesozoic calcareous sandstone..........	B. Gross, three-fourths of a mile from Liverpool, on Little Conewago between Gross and Spahn's.	
329......	Clay and coal..........	B. Gross, three-fourths of a mile north of Liverpool; J. Spahn's farm.	
330......	Sandy slate, with specular iron..........	W. R. Smith, one-half mile west of Conewago.	

CATALOGUE OF SPECIMENS—CONTINUED.

No. of specimen.	Character.	Locality.	Remarks.
331	Micaceous ore and magnetite	W. R. Smith, one-fourth of a mile west of Conewago.	Strongly magnetic.
332	Mesozoic mud rock	W. R. Smith, one-fourth of a mile west of Conewago.	
333	Sandstone, with specular iron	W. R. Smith, one-fourth of a mile west of Conewago.	
334	Dolerite	S. Lichte's bank, on Dillsburg and Berlin road, nine miles from Dillsburg.	No. CXX.
335	Ferruginous sandstone	S. Lichte's bank, on Dillsburg and Berlin road, fifteen miles from York.	
336	Porous sandstone, with fragments of the chlorite slates.	Benner's hill, second field north of farm house.	
337	Clay slate.	Benner's hill.	
338	White sandstone.	Benner's hill, across road from farm house.	
339	Dolerite, with hornblende.	Granite spur.	
340	Dolerite, with hornblende.	Culp's hill.	
341	Slaty sand rock, impregnated with magnetic iron ore.	M'Knight's hill	Strongly magnetic.
342	Hornblende and epidote	M'Knight's hill	Magnetic.
343	Hornblende, with epidote	M'Knight's hill.	
344	Felspar porphyry	M'Knight's hill.	
345	Hornblendic dolerite	Devil's Den.	
346	Red hematite, micaceous ore with malachite	"Mumper" mine, M'Cormick's bank.	
347	Limonite	Reading Coal and Iron Co.'s bank, six and a half miles from Dillsburg.	
348	Magnetic and micaceous ore	Near "Altland" bank; M'Cormick's	No. CXXI, magnetic.
349	Specular ore	Near "Altland" bank; M'Cormick's	No. CXXI, mine b'k
350	Magnetic and micaceous ore	"Altland" or Mine bank, six and a half miles south of Dillsburg.	No. CXXI, magnetic.
351	Magnetic, with calcite and malachite	"Altland" bank	No. CXXI, magnetic.
352	Ferruginous argillite	North end of M'Cormick's property; Becker's farm.	
353	Magnetic ore	A. P. Walker, Rossville	Strongly magnetic.

354	Tourmaline	A. P. Walker, Rossville.	
355	Sandy limonite	Field 100 feet from Ex-Gov. Porter's old opening on Yellow Breeches creek.	(Fuller's) strongly magnetic.
356	Clay ore	Landis' farm on Yellow Breeches creek, near Coover's bridge.	Strongly magnetic.
357	Clay matrix, with limonite, magnetite, & pyrite,	Underwood mine, one mile from Dillsburg	Strongly magnetic.
358	Clay matrix, with limonite, magnetite, & pyrite,	Underwood	Strongly magnetic.
359	Decomposed slate, with oxide of iron	M'Cormick's "Mumper" mine, one mile north-east of Dillsburg.	Strongly magnetic.
360	Specular magnetic ore	M'Cormick's mine, one mile north-east of Dillsburg.	No. CXXIII, strongly magnetic.
361	Dolerite	M'Cormick's Mumper mine, one mile north-east of Dillsburg.	
362	Dolerite	Logan shaft, M'Cormick's mine.	
363	Dolerite	M'Cormick's mine, one mile south-east of Dillsburg.	
364	Dolerite	M'Cormick's Mumper mine, one mile north-east of Dillsburg.	
365	Limonite	Bender's farm, Stoner and Hildebrand's lease,	No. CXXV.
366	Limonite and specular ore in clay	Wolf's bank, three and one-half miles west of Dillsburg.	
367	Arenaceous limonite	Heek's, one-half mile north of Wolf's.	

List of Banks with the Catalogue Numbers of the Specimens taken from each.

No. of Bank.	No. of Specimens.
I	3, 4.
II	5.
III	7, 10, 11.
IV	12.
V	13.
VI	14, 15, 16, 17.
VII	
VIII	46.
IX	
X	49.
XI	50, 51, 52.
XII	53, 54, 55.
XIII	56, 57, 58.
XIV	273, 274.
XV	
XVI	66.
XVII	67.
XVIII	
XIX	68, 69, 70, 71, 72.
XX	
XXI	73.
XXII	
XXIII	
XXIV	74, 75.
XXV	76.
XXVI	77.
XXVII	78.
XXVIII	79, 80.
XXIX	81, 82, 83, 84, 85.
XXX	
XXXI	86, 87, 88, 89.
XXXII	91, 92.
XXXIII	93.
XXXIV	
XXXV	95.
XXXVI	97, 98.
XXXVII	94.
XXXVIII	99.
XXXIX	103.
XL	104.
XLI	110.
XLII	111, 112, 113
XLIII	
XLIV	114.
XLV	
XLVI	
XLVII	107 (?)
XLVIII	

No. of Bank.	No. of Specimens.
XLIX	
L	
LI	
LII	117.
LIII	
LIV	118.
LIV *a*	118 *a*.
LIV *b*	118 *b*.
LIV *c*.	118 *c*.
LIV *d*	118 *d*.
LIV *e*	118 *e*.
LIV *f*	118 *f*.
LIV *g*	118 *g*.
LIV *h*	118 *h*.
LIV *i*	118 *i*.
LV	260, 261, 262, 263.
LVI	
LVII	256, 257.
LVIII	259.
LIX	
LX	
LXI	285, 286.
LXII	
LXIII	290, 291, 292, 293, 294.
LXIV	295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305.
LXV	309, 310, 311.
LXVI	308.
LXVII	
LXVIII	
LXIX	
LXX	139.
LXXI	140.
LXXII	144.
LXXIII	146.
LXXIV	147.
LXXV	
LXXVI	
LXXVII	148.
LXXVIII	149.
LXXIX	157.
LXXX	158.
LXXXI	161, 162.
LXXXII	171.
LXXXIII	197.
LXXXIV	219.
LXXXV	
LXXXVI	227.

No. of Bank.	No. of Specimens.
LXXXVII	
LXXXVIII	236.
LXXXIX	
XC	
XCI	175, 229.
XCII	253, 254.
XCIII	
XCIV	232, 233, 234, 235, 275, 276.
YCV	242.
XCVI	238.
XCVII	
XCVIII	245, 247, 249
XCIX	255.
C	248.
CI	250.
CII	251, 252.
CIII	
CIV	
CV	
CVI	
CVII	
CVIII	256.
CIX	
CX	
CXI	
CXII	155 (?)
CXIII	176.
CXIV	
CXV	177.
CXVI	
CXVII	155 (?)
CXVIII	
CXIX	331, 332, 333
CXX	334, 335.
CXXI	346, 348, 349, 350, 351, 352.
CXXII	362.
CXXIII	359, 360, 361, 363, 364.
CXXIV	357, 358.
CXXV	365.
CXXVI	

The following chapter includes the bearings, distances and true altitudes above high tide at Philadelphia, of all points determined with the transit during the field work of 1874, and is in fact a rescript from the field note books, made for the purpose of enabling any one interested in the matter to fix the stations for which the said altitudes were calculated.

CHAPTER V.

Statement showing part of the Field Work of 1874, *as determined by the Transit.*

Station.........	Dist. in feet...	Bearing.......	Elevat'n above high tide at Phila.*.......	Remarks.
1,485.........	...	....	384.77	Sta. 1,845—Centre of Square, York.
1,485 to 1,486,	252	E. 17° 30 N.	389.68	Sta. 1,486—Centre of Main and Duke streets.
1,486—1,487,	235	E. 16° 45′ N.	392.76	Sta. 1,487—Centre of Main and Queen streets.
1,487—1,488,	233	E. 19° 30′ N.	396.28	
1,488—1,489,	345	E. 16° 15′ N.	403.11	
1,489—1,490,	480	N. 16° 45′ W.	397.54	
1,490—1,491,	590	N. 17° 15′ W.	382.44	Sta. 1,492—Centre of Queen [and Chestnut streets.
1,491—1,492,	142	N. 18° 45′ W.	378.39	
1,492—1,493,	529	E. 33° 00′ N.	372.84	
1,493—1,494,	158	E. 35° 00 N.	368.29	
1,494—1,495,	480	N. 24° 45′ W.	371.07	
1,495—1,496,	294	N. 22° 00′ W.	374.39	
1,496—1,497,	227	N. 5° 30′ W.	357.23	
1,497—1,498,	540	N. 22° 00′ E.	345.46	
1,498—1,499,	615	N. 18° 30′ E.	352.41	
1,499—1,600,	565	N. 15° 30′ E.	352.92	
1,600—1,601,	360	N. 16° 00′ E.	350.18	
1,601—1,602,	700	N. 7° 30′ E.	348.78	
1,602—1,603,	720	N. 9° 00′ E.	346.69	
1,603—1,604,	100	N. 21° 00′ W.	343.84	
1,604—1,605,	515	N. 12° 30 E.	342.66	
1,605—1,606,	422	N. 14° 00′ E.	342.41	Sta. 1,607—Opposite Louck's [mill.
1,606—1,607,	455	N. 14° 00′ E.	342.55	
1,607—1,608,	212	E. 14° 15 N.	345.62	
1,608—1,609,	489	E. 15° 00′ S.	346.30	
1,609—1,610,	210	E. 18° 15′ S.	346.30	
1,610—1,611,	586	N. 9° 00 E.	348.00	
1,611—1,612,	367	N. 8° 15′ E.	343.52	
1,612—1,613,	585	N. 9° 00′ E.	338.61	
1,613—1,614,	535	N. 9° 30′ E.	344.39	
1,614—1,615,	412	N. 8° 00′ E.	341.05	
1,615—1,616,	266	E. 31° 00′ N.	342.99	
1,616—1,617,	370	N. 39° 15′ E.	365.78	
1,617—1,618,	308	E. 30° 30′ S.	369.17	
1,618—1,619,	392	E. 29° 00′ S.	374.85	
1,619—1,620,	462	N. 44° 00′ E.	410.01	
1,620—1,621,	297	N. 45° 45′ E.	436.32	

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* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station.......	Dist. in feet...	Bearing.......	Elevat'n above high tide at Phila.*......	Remarks.
1,621 to 1,622,	403	East.........	478.55	
1,622—1,623,	182	E. 3° 45′ N.	502.83	
1,623—1,624,	512	E. 10° 30′ N.	543.74	
1,624—1,625,	455	E. 10° 00′ N.	559.62	Sta. 1,626—Fork of road at [school house.
1,625—1,626,	337	E. 10° 30′ N.	555.21	
1,626—1,627,	350	N. 4° 00′ W.	575.06	
1,627—1,628,	168	N. 1° 00′ W.	577.50	
1,628—1,629,	675	N. 42° 45′ E.	605.99	
1,629—1,630,	432	N. 52° 30′ E.	647.03	
1,630—1,631,	550	N. 69° 00′ E.	679.65	
1,631—1,632,	200	E. 25° 00′ N.	677.91	
1,632—1,633,	593	N. 45° 00′ E.	688.23	
1,633—1,634,	600	N. 45° 30′ E.	659.43	
1,634—1,635,	385	N. 46° 00′ E.	647.34	
1,635—1,636,	375	N. 44° 30 E.	621.16	
1,636—1,637,	169	N. 56° 15′ E.	619.20	
1,637—1,638,	185	N. 61° 45′ E.	604.64	
1,638—1,639,	365	N. 23° 00′ E.	596.14	
1,639—1,640,	248	N. 55° 00′ E.	588.58	
1,640—1,641,	395	N. 46° 45′ E.	572.62	
1,641—1,642,	453	N. 47° 15′ E.	551.69	
1,642—1,643,	695	N. 60° 45′ E.	521.80	
1,643—1,644,	590	N. 64° 00′ E.	529.00	Sta. 1,645—Centre of Cross [Roads.
1,644—1,645,	505	N. 61° 30′ E.	5[illegible]9.30	
1,645—1,646,	456	N. 29° 00′ W.	499.48	
1,646—1,647,	530	N. 27° 15′ W.	462.22	
1,647—1,648,	420	N. 27° 30′ W.	414.68	
1,648—1,649,	390	N. 26° 15′ W.	382.39	Station 1,650—Smyser's ore [bank.
1,649—1,650,	330	W. 00° 30′ S.	363.22	
1,645—1,651,	590	S. 35° 30′ E.	577.15	
1,651—1,652,	409	S. 32° 00′ E.	613.02	
1,652—1,653,	450	S. 22° 30′ E.	6[illegible].37	
1,653—1,654,	373	S. 8° 00′ E.	677.59	
1,654—1,655,	493	S. 15° 30′ E.	7[illegible]2.69	
1,655—1,656,	375	S. 9° 30′ E.	735.75	
1,656—1,657,	220	S. 33° 30′ E.	737.60	Sta. 1,657—Opposite church.
1,657—1,658,	272	S. 51° 00′ E.	732.87	
1,658—1,659,	355	S. 49° 00′ E.	7[illegible]0.43	
1,659—1,660,	485	S. 42° 30′ E.	683.21	
1,660—1,661,	655	S. 45° 00′ E.	6[illegible]3,69	
1,661—1,662,	708	S. 28° 00′ E	588.45	
1,662—1,663,	530	S. 32° 30′ E.	5[illegible]3.05	
1,663—1,664,	425	S. 46° 00′ E.	5[illegible].28	
1,664—1,665,	627	S. 33° 15′ E.	4[illegible]6.73	
1,665—1,666,	440	S. 28° 30′ E.	473.31	
1,666—1,667,	336	S. 27° 00′ E.	4[illegible]9.41	
1,667—1,668,	700	S. 23° 15 E.	451.07	
1,668—1,669,	582	S. 23° 15 E.	450.87	
1,669—1,670,	500	S. 15° 45′ E.	440.67	
1,670—1,671,	555	S. 31° 30′ E.	440.67	
1,671—1,672,	538	S. 32° 30′ E.	447.72	Station 1,674—Bridge over [Wrightsville railroad at [Heistand's.
1,672—1,673,	250	S. 42° 15′ E.	451.00	
1,673—1,674;	450	S 3[illegible]° 00′ E.	455.86	
1,674—1,675,	482	S. 24° 30′ E.	452.34	
1,675—1,676,	315	S. 25° 00′ E.	453.85	
1,676—1,677,	520	S. 26° 00′ E.	457.49	

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—Continued.

Station........	Dist. in feet...	Bearing.	Elevat'n above high tide at Phila*........	Remarks.
1,677 to 1,678,	637	S. 24° 15′ E.	440.61	Sta. 1,678—Cross roads.
1,678—1,679,	620	S. 25° 15′ E.	445.32	Sta. 1,679—Fork of road.
1,679—1,680,	507	S. 9° 30′ W.	459.62	
1,680—1,681,	712	S. 1° 00′ W.	478.70	Sta. 1,681—Opposite lane.
1,681—1,682,	500	South........	470.00	
1,682—1,683,	430	S. 1° 15′ W.	473.74	
1,683—1,684,	730	S. 1° 00′ W.	497.54	
1,684—1,685,	300	S. 5° 45′ E.	513.05	
1,685—1,686,	642	S. 1° 00′ W.	549.45	
1,686—1,687,	615	S. 20° 00′ W.	608.24	Sta. 1,687—Opposite lane.
1,687—1,688,	350	S. 13° 30′ W.	649.19	
1,688—1,689,	405	S. 10° 00′ W.	680.98	
1,689—1,690,	386	S. 14° 15′ W.	677.85	
1,690—1,691,	610	S. 1° 30′ E.	645.58	
1,691—1,692,	320	S. 8° 30′ E.	637.20	Sta. 1,692—Cross-r'ds, Longstown.
1,692—1,693,	518	S. 27° 30′ W.	637.51	
1,693—1,694,	412	S. 34° 00′ W.	648.63	
1,694—1,695,	450	S. 23° 00′ W.	629.77	
1,695—1,696,	555	S. 65° 00′ W.	627.33	
1,696—1,697,	196	S. 11° 45′ W.	624.08	
1,697—1,698,	400	S. 10° 00′ W.	599.68	Sta. 1,698—Fork of road.
1,698—1,699,	323	S. 37° 30′ E.	582.21	
1,699—1,800,	259	S. 6° 00′ W.	577.31	
1,800—1,801,	545	S. 3° 00′ E.	531.53	
1,801—1,802,	422	S. 18° 00′ W.	511.91	Sta. 1,802—School house.
1,802—1,803,	180	S. 50° 00′ W.	515.83	
1,803—1,804,	470	S. 37° 15′ W.	487.25	
1,804—1,805,	445	S. 54° 00′ W.	456.46	
1,805—1,806,	219	S. 18° 15′ E.	470.78	
1,806—1,807,	271	S. 43° 00′ E.	476.06	
1,807—1,808,	475	S. 55° 00′ E.	483.66	
1,808—1,809,	189	S. 61° 15′ E.	475.97	
1,809—1,810,	268	S. 61° 00′ E.	468.17	Sta. 1,810—Fork of road.
1,810—1,811,	292	S. 17° 30′ W.	464.78	Sta. 1,811—Wagner's mill dam.
1,811—1,812,	245	S. 33° 30′ W.	474.41	
1,812—1,813,	290	S. 28° 00′ W.	481.92	
1,813—1,814,	222	S. 38° 45′ W	488.51	
1,814—1,815,	360	S. 15° 15′ W.	495.75	
1,815—1,816,	235	S. 2° 45′ E.	501.84	Sta. 1,816—Turn in road.
1,816—1,817,	380	W. 7° 15′ S.	510.24	
1,817—1,818,	233	W. 8° 15′ S.	525.19	
1,818—1,819,	392	W. 12° 15′ S.	556.98	Sta. 1,819—Fork of road.
1,819—1,820,	247	S. 33° 00′ E.	546.21	
1,820—1,821,	318	S. 23° 30′ E.	540.58	
1,821—1,822,	345	S. 11° 45′ E.	557.04	
1,822—1,823,	380	S. 11° 00′ E.	583.45	
1,823—1,824,	224	S. 7° 30′ E.	587.35	
1,824—*1,825,*	179	S. 9° 30′ E.	575.29	
1,825—1,826,	241	S. 10° 30′ E.	564.85	
1,826—1,827,	357	S. 8° 30′ E.	546.07	
1,827—1,828,	300	S. 23° 30′ E.	547.36	
1,828—1,829,	358	S. 29° 45′ E.	539.34	
1,829—1,830,	409	S. 25° 30′ E.	534.92	
1,830—1,831,	369	S. 22° 00′ E.	550.90	
1,831—1,832,	169	E. 2° 15′ N.	546.37	Sta. 1,832—Fork of road at Musselman's bank.
1,825—1,144,	366	W. 2° 15′ N.	569.10	

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station......	Dist. in feet...	Bearing......	Elevat'n above high tide at Phila.*......	Remarks.
1,144 to 1,145,	360	W. 3° 15′ N.	554.95	
1,145—1,146,	265	W. 3° 45′ N.	534.23	
1,146—1,147,	404	S. 56° 30′ W.	486.64	
1,147—1,148,	282	S. 48° 00′ W.	474.65	
1,148—1,149,	498	S. 10° 30′ W.	478.14	
1,149—1,150,	296	S. 4° 30′ E.	483.05	
1,150—1,151,	512	S. 7° 45′ E.	488.43	Sta. 1,151—Fork of road.
1,151—1,152,	392	W. 19° 00′ N.	500.39	
1,152—1,153,	375	W. 14° 00′ N.	537.40	Sta. 1,153—Fork of road.
1,153—1,154,	419	S. 2° 15′ W.	544.94	
1,154—1,155,	330	S. 5° 30′ W.	545.40	
1,155—1,156,	372	S. 4° 30′ W.	556 19	
1,156—1,157,	353	S. 3° 30′ W.	574 37	
1,157—1,158,	312	S. 4° 30′ W.	583.89	
1,158—1,159,	413	S. 2° 45′ W.	593.51	
1,159—1,160,	340	S. 4° 30′ W.	612.89	
1,160—1,161,	398	S. 5° 15′ W.	626.30	Sta. 1,162—Turn in road.
1,161—1,162,	267	S. 60° 00′ W.	606.11	
1,162—1,163,	222	S. 66° 00′ W.	573.94	Sta. 1,163—Turn in road.
1,163—1,164,	350	N. 54° 00′ W.	542.61	Sta. 1,164—Turn in road.
1,164—1,165,	316	S. 29° 30′ W.	538.94	
1,165—1,166,	338	S. 28° 30′ W.	571.93	
1,166—1,167,	235	S. 29° 30′ W.	580.81	
1,167—1,168,	420	S. 52° 00′ W.	585.68	
1,168—1,169,	219	S. 55° 00′ W.	573.48	
1,169—1,170,	229	S. 52° 00′ W.	595.90	
1,170—1,171,	117	S. 71° 00′ W.	587.64	
1,171—1,172,	317	S. 60° 45′ W.	572.42	
1,172—1,173,	159	W. 9° 30′ N.	590.37	
1,173—1,174,	380	N. 42° 45′ W.	631.52	
1,174—1,175,	445	N. 58° 00′ W.	655.46	
1,175—1,176,	246	N. 61° 00′ W.	658 31	
1,176—1,177,	402	N. 59° 00′ W.	637.29	
1,177—1,178,	209	N. 63° 00′ W.	629.64	Sta. 1,178—Fork of r'd, Peach
1,178—1,179,	400	S. 6° 15′ W.	645.12	[Bottom turnpike.
1,179—1,180,	395	S. 6° 00′ E.	663.49	
1,180—1,181,	401	S. 6° 30′ E.	670.95	
1,181—1,182,	398	S. 6° 00′ E.	679.63	
1,182—1,183,	359	S. 7° 00′ E.	672.52	Sta. 1,183—Innersville.
1,183—1,184,	387	S. 22° 00′ E.	684.67	Sta. 1,184—Innersville.
1,184—1,185,	450	S. 23° 30′ E.	716.31	
1,185—1,186,	374	S. 22° 45′ E.	740.02	
1,186—1,187,	490	S. 00° 45′ W.	707.29	
1,187—1,188,	470	S. 15° 15′ E.	687.60	
1,183—1,189,	360	S. 19° 00′ E.	689.18	
1,189—1,190,	406	S. 18° 45′ E.	706.31	
1,190—1,191,	358	S. 17° 00′ E.	717.77	Sta. 1,191—Fork of road.
1,191—1,192,	405	S. 18° 15′ E.	733.69	
1,192—1,193,	340	S. 19° 00′ E.	752.63	
1,193—1,194,	326	S. 16° 30′ E.	768.73	
1,194—1,195,	355	S. 17° 15′ E.	744.91	
1,195—1,196,	476	S. 17° 45′ E.	758.33	
1,196—1,197,	432	S. 18° 15′ E.	737.59	Sta. 1,197—Cross-roads.
1,197—1,198,	245	S. 5° 15′ E.	739.87	
1,198—1,199,	411	S. 4° 45′ W.	739.38	
1,199—*1,300*,	343	S. 1° 45′ E.	736.40	

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet...	Bearing........	Elevat'n above high tide at Phila.*........	Remarks.
1,300 to 1,301,	422	S. 1° 30′ E.	739.35	
1,301—1,302,	242	S. 13° 00′ E.	728.36	
1,302—1,303,	262	S. 24° 45′ E.	714.03	
1,303—1,304,	454	S. 17° 00′ E.	695.55	
1,304—1,305,	320	S. 10° 15′ E.	690.91	
1,305—1,306,	279	S. 11° 30′ E.	687.98	
1,306—1,307,	442	S. 17° 45′ W.	684.62	
1,307—1,308,	351	S. 18° 30′ W.	691.25	
1,308—1,309,	265	S. 20° 45′ W.	694.72	Sta. 1,309—Fork of road.
1,309—1,310,	330	S. 25° 30′ W.	693.00	
1,310—1,311,	350	S. 41° 30′ W.	670.63	
1,311—1,312,	453	S. 48° 00′ W.	656.13	
1,312—1,313,	419	S. 57° 30′ W.	651.86	
1,313—1,314,	430	S. 54° 30′ W.	648.72	
1,314—1,315,	310	S. 39° 30′ W.	640.26	
1,315—1,316,	349	S. 44° 30′ W.	612.86	Sta. 1,316—Cross-roads.
1,316—1,317,	439	S. 40° 30′ W.	553.77	
1,317—1,318,	487	S. 41° 00′ W.	521.92	
1,318—1,319,	390	S. 42° 45′ W.	489.63	
1,319—1,320,	285	S. 48° 15′ W.	467.20	
1,320—1,321,	251	S. 45° 00′ W.	446.77	
1,321—1,322,	237	S. 30° 30′ W.	443.45	
1,322—1,323,	207	S. 3° 30′ E.	439.41	
1,323—1,324,	322	S. 11° 30′ E.	444.56	
1,324—1,325,	331	S. 21° 30′ E.	454.49	
1,325—1,326,	395	S. 20° 30′ E.	465.16	
1,326—1,327,	367	S. 20° 45′ E.	461.12	
1,327—1,328,	407	S. 19° 30′ E.	456.97	Sta. 1,328—Independence saw and grist mill.
1,328—1,329,	420	S. 41° 00′ E.	466.25	
1,329—1,330,	310	S. 44° 30′ E.	463.27	Sta. 1,330—Opposite road to Dallastown.
1,330—1,331,	328	S. 36° 30′ E.	472.22	
1,331—1,332,	291	S. 51° 45′ E.	479.32	
1,332—1,333,	335	S. 44° 00′ E.	461.10	
1,333—1,334,	309	S. 67° 45′ E.	456.34	Sta. 1,334—Bridge over Codorus creek.
1,334—1,335,	436	S. 10° 00′ E.	452.15	
1,335—1,336,	315	S. 7° 00′ E.	466.80	Sta. 1,336—Road to left.
1,336—1,337,	375	S. 9° 45′ E.	467.66	
1,337—1,338,	272	S. 14° 30′ E.	474.38	
1,338—1,339,	470	S. 62° 45′ E.	475.60	
1,339—1,340,	380	S. 32° 45′ E.	486.54	
1,340—1,341,	308	S. 34° 00′ E.	501.76	Sta. 1,341—Gladfelter's lane.
1,341—1,342,	404	S. 30° 00′ E.	533.11	Sta. 1,342—Road to left.
1,342—1,343,	393	E. 22° 00′ N.	538.61	
1,343—1,344,	341	E. 24° 00′ N.	549.11	
1,344—1,345,	338	E. 27° 00′ N.	560.50	
1,345—1,346,	342	E. 31° 45′ N.	545.79	
1,346—1,346*a*	290	N. 8° 30′ E.	521.02	Sta. 1,346a—Gladfelter's old bank.
1,342—1,347,	420	W. 24° 00′ S.	534.33	
1,347—1,348,	334	W. 21° 15′ S.	533.06	
1,348—1,349,	260	W. 31° 30′ S.	523.62	
1,349—1,350.	419	S. 43° 15′ W.	522.28	
1,350—1,351,	265	W. 43° 15′ S.	538.07	
1,351—1,352,	311	S. 47° 00′ W.	561.92	
1,352—1,353,	324	S. 58° 00′ W.	542.16	

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* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station.......	Dist. in feet...	Bearing.......	Elevat'n above high tide at Phila.*	Remarks.
1,353 to 1,354,	316	S. 62° 15′ W.	545.38	
1,354—1,355,	410	S. 66° 30′ W.	556.94	
1,355—1,356,	379	S. 64° 00′ W.	542.05	
1,356—1,357,	265	S. 60° 45′ W.	529.73	Sta. 1,357—David Shue's.
1,357—1,358,	190	S. 38° 45′ W.	522.32	
1,358—1,359,	254	W. 3° 30′ N.	521.74	
1,359—1,360,	327	W. 10° 45′ S.	524.13	
1,360—1,361,	390	S. 58° 15′ W.	533.41	
1,361—1,362,	287	S. 60° 30′ W.	537.92	
1,362—1,363,	445	S. 60° 45′ W.	535.34	
1,363—1,364,	155	S. 52° 30′ W.	534.94	Sta. 1,364—Road to right.
1,364—1,365,	329	N. 40° 00′ W.	511.22	
1,365—1,366,	258	W. 5° 30′ S.	518.88	
1,366—1,367,	324	N. 40° 45′ W.	529.05	
1,367—1,368,	226	N. 43° 30′ W.	534.90	
1,368—1,369,	292	N. 44° 30′ W.	542.55	
1,369—1,370,	206	N. 42° 00′ W.	550.09	Sta. 1,370—Blacksmith shop and road to left.
1,370—1,371,	263	S. 39° 30′ W.	566.13	
1,371—1,372,	361	S. 31° 45′ W.	565.30	
1,372—1,373,	375	S. 54° 30′ W.	582.63	
1,373—1,374,	410	S. 55° 30′ W.	589.31	
1,374—1,375,	329	S. 32° 00′ W.	572.86	Sta. 1,375—Lane to left.
1,375—1,376,	194	S. 60° 45′ W.	579.30	
1,376—1,377,	180	W. 8° 45′ S.	580.87	
1,377—1,378,	328	W. 33° 15′ S.	595.76	
1,378—1,379,	142	W. 20° 15′ S.	595.96	Sta. 1,379—Turn in road.
1,379—1,380,	272	N. 27° 30′ W.	621.23	Sta. 1,380—Second turn in road.
1,380—1,381,	197	W. 2° 45′ S.	626.67	
1,381—1,382,	216	W. 21° 00′ S.	643.93	
1,382—1,383,	505	W. 13° 30′ S.	701.25	
1,383—1,384,	361	W. 14° 00′ S.	717.10	
1,384—1,385,	275	N. 45° 00′ W.	737.09	
1,385—1,386,	360	W. [illegible] 15′ N.	734.28	Sta. 1,386—Cross-roads, Loganville.
1,386—1,387,	100	S. 30° 45′ W.	731.08	
1,387—1,388,	470	S. 29° 00′ W.	746.12	
1,388—1,389,	370	S. 19° 30′ W.	739.24	
1,389—1,390,	479	S. 32° 45′ W.	713.90	
1,390—1,391,	337	S. 10° 00′ W.	701.67	
1,391—1,392,	431	S. 7° 15′ W.	708.79	Sta. 1,392—R'd to right, South Loganville.
1,392—1,393,	339	S. 11° 30′ W.	731.35	
1,393—1,394,	157	S. 11° 00′ W.	738.70	Sta. 1,394—Road to right South Loganville.
1,394—1,395,	310	W. 5° 30′ N.	742.20	
1,395—1,396,	146	W. 21° 00′ S.	740.29	Sta. 1,396—Cross-roads.
1,396—1,397,	387	S. 28° 45′ W.	735.10	
1,397—1,398,	[illegible]	S. 35° 30′ W.	719.87	
1,398—1,399,	417	S. 51° 45′ W.	682.86	
1,399—1,500,	213	S. 54° 00′ W.	675.06	
1,500—1,501,	279	S. 56° 30′ W.	648.33	
1,501—1,502,	471	S. 44° 00′ W.	635.33	
1,502—1,503,	438	S. 51° 15′ W.	606.29	
1,503—1,504,	314	S. 67° 00 W.	603.90	
1,504—1,505,	232	S. 45° 00′ W.	620.02	
1,505—1,506,	281	W. 3° 15′ S.	648.57	
1,506—1,507,	353	W. 7° 00′ S.	676.77	

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*To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet...	Bearing........	Elevat'n above high tide at Phila.*......	Remarks.
1,507 to 1,508,	350	W. 13° 00′ S.	719.63	
1,508—1,509,	207	W. 21° 45′ S.	727.64	
1,509—1,510,	327	W. 21° 15′ S.	693.27	
1,510—1,511,	398	W. 30° 45′ N.	657.21	Sta. 1,511—C. Gladfelter's.
1,511—1,512,	483	W. 18° 00′ N.	622.82	
1,512—1,513,	336	W. 19° 30′ N.	654.54	
1,513—1,514,	378	W. 26° 00′ S.	678.69	
1,514—1,515,	420	S. 54° 00′ W.	709.16	
1,515—1,516,	390	S. 54° 00′ W.	735.02	
1,516—1,517,	540	S. 51° 45′ W.	761.10	
1,517—1,518,	570	S. 59° 30′ W.	809.78	
1,518—1,519,	161	S. 55° 00′ W.	815.87	Sta. 1,519—Cross-road.
1,519—1,534,	195	S. 27° 30′ E.	829.93	
1,534—1,535,	467	W. 25° 30′ S.	809.57	
1,535—1,536,	307	W. 25° 30′ S.	794.04	
1,536—1,537,	368	W. 24° 30′ S.	768.02	
1,537—1,538,	400	W. 24° 30′ S.	798.94	
1,538—1,539,	281	W. 39° 45′ S.	795.09	
1,539—1,540,	520	S. 49° 30′ W.	754.27	Sta. 1,540—W. Grow's.
1,540—1,541,	284	W. 23° 30′ S.	778.35	
1,541—1,542,	276	W. 18° 00′ S.	798.80	
1,542—1,543,	455	W. 30° 30′ S.	804.49	
1,543—1,544,	274	W. 32° 30′ S.	797.48	
1,544—1,545,	472	W. 32° 45′ S.	780.20	
1,545—1,546,	219	W. 15° 15′ S.	764.91	
1,546—1,547,	287	W. 34° 30′ S.	751.62	
1,547—1,548,	267	W. 31° 00′ S.	760.78	
1,548—1,549,	310	W. 9° 45′ S.	740.32	
1,549—1,550,	473	W. 18° 15′ S.	708.72	
1,550—1,551,	464	W. 11° 45′ S.	663.99	
1,551—1,552,	414	W. 20° 45′ N.	617.37	
1,552—1,553,	400	W. 28° 15′ N.	578.33	
1,553—1,554,	243	W. 24° 30′ N.	560.32	
1,554—1,555,	247	W. 5° 00′ N.	534.14	
1,555—1,556,	126	W. 37° 37′ S.	520.90	
1,556—1,557,	541	S. 41° 00′ W.	487.74	
1,557—1,558,	305	W. 1° 00′ S.	481.52	
1,558—1,559,	270	N. 30° 45′ W.	475.47	
1,559—1,560,	254	N. 30° 15′ W.	490.46	Sta. 1,560—N. C. R. R., opposite Seitz's mill.
1,560—1,560*a*	140	S. 18° 30′ W.	488.22	
1,560*a*–1,561,	274	S. 47° 15′ W.	490.30	
1,561—1,562,	251	W. 28° 45′ S.	483.22	
1,562—1,563,	240	W. 20° 45′ S.	484.06	
1,563—1,564,	254	S. 50° 15′ W.	484.57	Sta. 1,564—School house.
1,564—1,565,	420	S. 2° 15′ W.	481.76	
1,565—1,566,	557	N. 2° 00′ W.	485.83	Sta. 1,566—Fork of road.
1,566—1,567,	380	S. 22° 00′ W.	489.71	
1,567—1,568,	133	S. 35° 30′ W.	487.00	Sta. 1,568—Zigler's mill.
1,568—1,569,	429	W. 6° 00′ S.	484.13	
1,569—1,570,	127	W. 3° 00′ S.	485.87	
1,570—1,571,	334	W. 19° 00′ S.	493.35	
1,571—1,572,	259	W. 27° 45′ S.	506.34	
1,572—1,573,	382	W. 24° 30′ S.	508.10	
1,573—1,574,	445	S. 56° 15′ W.	521.05	

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet ..	Bearing........	Elevat'n above high tide at Phila.*......	Remarks.
1,574 to 1,575,	190	W. 14° 15′ S.	521.54	
1,575—1,576,	297	W. 12° 00′ N.	530.60	
1,576—1,577,	410	W. 28° 30′ N.	538.35	
1,577—1,578,	328	W. 20° 15′ N.	541.11	
1,578—1,579,	149	W. 26° 00′ N.	546.09	Sta. 1,579—Road to left.
1,579—1,580,	350	W. 6° 00 N.	544.55	
1,580—1,581,	310	W. 9° 30′ S.	522.99	
1,581—1,582,	318	S. 50° 30′ W.	576.74	
1,582—1,583,	440	W. 19° 00′ S.	578.68	
1,583—1,584,	150	W. 16° 45′ S.	581.43	Sta. 1,583—Road to right.
1,584—1,585,	154	W. 31° 00′ S.	577.09	
1,571—1,586,	141	E. 18° 45′ N.	488.10	
1,586—1,587,	185	N. 32° 00′ W.	495.15	
1,587—1,588,	182	N. 39° 45′ W.	505.31	
1,588—1,589,	439	N. 54° 00′ W.	534.90	
1,589—1,590,	238	N. 58° 45′ W.	545.28	
1,590—1,591,	374	N. 46° 30′ W.	569.96	
1,591—1,592,	358	N. 44° 00′ W.	606.05	
1,592—1,593,	377	N. 45° 30′ W.	626.97	
1,593—1,594,	505	N. 43° 15′ W.	657.52	
1,594—1,595,	78	N. 52° 00′ W.	662.15	
1,595—1,596,	116	W. 3° 00′ N.	671.05	
1,596—1,597,	517	N. 34° 00′ W.	701.09	
1,597—1,598,	255	N. 46° 00′ W.	700.66	
1,598—1,599,	248	N. 38° 15′ W.	694.88	Sta. 1,599—Cross-roads.
1,599—1,700,	270	N. 11° 15′ W.	677.63	
1,700—1,701,	500	N. 17° 00′ W.	625.68	
1,701—1,702,	330	N. 33° 15′ W.	590.70	
1,702—1,703,	237	N. 58° 45′ W.	559.16	
1,703—1,704,	90	N. 26° 00′ W.	533.22	
1,704—1,705,	642	N. 1° 00′ W.	588.82	
1,705—1,706,	159	N. 55° 15′ E.	577.31	
1,706—1,707,	146	N. 30° 00′ E.	563.32	
1,707—1,708*a*	123	N. 28° 15′ E.	523.92	
1,585—1,708,	234	N. 8° 45′ W.	605.08	
1,708—1,709,	318	N. 57° 45′ W.	631.03	
1,709—1,710,	207	N. 51° 45′ W.	631.88	
1,710—1,711,	396	N. 67° 00′ W.	633.23	
1,711—1,712,	410	N. 70° 15′ W.	652.30	
1,712—1,713,	553	N. 75° 15′ W.	683.10	
1,713—1,714,	342	N. 63° 00′ W.	712.00	
1,714—1,715,	394	N. 58° 00′ W.	740.05	Sta. 1,715—Road to left.
1,715—1,716,	326	N. 64° 30′ W.	728.22	
1,716—1,717,	360	W. 9° 30′ N.	703.10	
1,717—1,718,	510	W. 7° 30′ N.	686.83	Sta. 1,718—Road to right.
1,718—1,719,	320	W. 6° 15′ N.	692.49	
1,719—1,720,	217	W. 6° 30′ S.	697.22	Sta. 1,720—School house
1,720—1,721,	331	S. 36° 30′ W.	683.09	
1,721—1,722,	481	S. 47° 30′ W.	663.51	
1,722—1,723,	317	S. 42° 30′ W.	655.20	
1,723—1,724,	422	W. 5° 15′ N.	631.78	
1,724—1,725,	415	W. 4° 45′ S.	605.01	
1,725—1,726,	386	W. 6° 15′ S.	584.59	
1,726—1,727,	337	W. 5° 00′ S.	566.66	Sta. 1,727—Mill-dam.

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet...	Bearing........	Elevat'n above high tide at Phila.*......	Remarks.
1,727 to 1,728,	283	W. 5° 15' S.	553.51	Sta. 1,727—Mill dam.
1,728—1,729,	102	W. 34° 00' S.	[illegible]	Sta. 1,729—Mill dam.
1,729—1,730,	353	S. 34° 15' W.	[illegible]	Sta. 1,730—Mill dam.
1,730—1,731,	400	S. 13° 00' W.	[illegible]	
1,731—1,732,	293	S. 50° 30' W.	[illegible]	
1,732—1,733,	398	S. 55° 15' W.	[illegible]	
1,733—1,734,	300	S. 43° 30' W.	609.72	
1,734—1,735,	430	S. 29° 30' W.	636.08	
1,735—1,736,	231	W. 11° 00' S.	647.10	
1,736—1,737,	432	W. 21° 00' S.	688.49	
1,737—1,738,	346	W. 20° 00' S.	717.83	
1,738—1,739,	152	W. 14° 30' S.	719.15	Sta. 1,739—Road to right.
1,739—1,740,	270	N. 28° 30' W.	712.78	
1,740—1,741,	400	N. 28° 00' W.	691.50	
1,741—1,742,	517	N. 29° 45' W.	687.00	
1,742—1,743,	322	N. 32° 45' W.	666.59	Sta. 1,744—Turn in road.
1,743—1,744,	444	W. 25° 45' S.	659.75	
1,744—1,745,	324	W. 22° 00' S.	647.99	
1,745—1,746,	270	W. 31° 45' S.	627.98	
1,746—1,747,	492	S. 58° 30' W.	599.79	
1,747—1,748,	400	N. 50° 30' W.	595.95	
1,748—1,749,	291	W. 21° 30' N.	583.18	
1,749—1,750,	229	W. 6° 00' N.	571.59	
1,750—1,751,	443	N. 58° 30' W.	592.46	
1,751—1,752,	277	W. 25° 45' S.	617.33	
1,752—1,753,	505	S. 48° 00' W.	677.12	
1,753—1,754,	286	S. 53° 45' W.	693.91	
1,754—1,755,	410	S. 63° 00' W.	699.53	
1,755—1,756,	429	S. 61° 00' W.	704.03	Sta. 1,756—Road to right.
1,756—1,757,	343	S. 60° 45' W.	701.15	
1,757—1,758,	433	S. 60° 00' W.	724.88	
1,758—1,759,	400	S. 53° 30' W.	717.08	
1,759—1,760,	3[illegible]	S. 52° 15' W.	706.10	
1,760—1,761,	415	S. 54° 30' W.	692.70	Sta. 1,761—Road to Jefferson.
1,761—1,762,	447	N. 26° 30' W.	676.34	
1,762—1,763,	251	N. 24° 00' W.	685.[illegible]	
1,763—1,764,	330	N. 24° 15' W.	664.[illegible]	
1,764—1,765,	390	N. 25° 00' W.	644.11	[end.
1,765—1,766,	320	N. 32° 00' W.	638.89	Sta. 1,766—Jeffers'n, south'rn
1,766—1,767,	393	N. 31° 30' W.	610.55	Sta. 1,767—Jefferson.
1,767—1,768,	268	N. 30° 30' W.	599.64	Sta. 1,768—Jefferson square.
1,768—1,769,	418	N. 32° 15' W.	611.80	Sta. 1,769—Jefferson, N. end.
1,769—1,770,	323	N. 31° 30' W.	641.35	
1,770—1,771,	364	N. 31° 15' W.	632.36	
1,771—1,772,	272	N. 32° 15' W.	605.43	
1,772—1,773,	345	N. 32° 00' W.	593.08	Sta. 1,773—Bridge over H. B.
1,768—1,774,	403	S. 59° 00' W.	595.09	Sta. 1,774—Jefferson. [R. R.
1,774—1,775,	435	S. 58° 00' W.	600.01	Sta. 1,775—Jefferson.
1,775—1,776,	449	S. 56° 30' W.	614.65	
1,776—1,777,	331	S. 54° 45' W.	608.39	Sta. 1,777—Road to left.
1,777—1,778,	470	S. 53° 15' W.	584.18	Sta. 1,778—E. Flickinger's
1,778—1,779,	434	S. 53° 30' W.	574.72	ore pits.
1,779—1,780,	272	S. 55° 15' W.	577.09	[ore p'ts.
1,780—1,781,	348	S. 67° 15' W.	559.10	Sta. 1,781—Opp. Shueman's

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet...	Bearing........	Elevat'n above high tide at Phila.*......	Remarks.
1,781 to 1,782,	398	S. 55° 15′ W.	538.60	
1,782—1,783,	422	S. 56° 15′ W.	547.80	
1,783—1,784,	410	S. 65° 15′ W,	549.60	
1,784—1,785,	380	S. 66° 00′ W.	545.61	
1,785—1,786,	370	S. 65° 00′ W.	563.37	
1 786—1,787,	405	S. 65° 30′ W.	572.20	
1,787—1,788,	400	S. 65° 15′ W.	583.84	
1,788—1,789,	354	S. 67° 00′ W.	574.35	
1,789—1,790,	368	S. 66° 30′ W.	559.04	
1,790—1,791,	452	W. 13° 00′ S.	558.27	
1,791—1,792,	340	W. 13° 45′ S.	552.52	
1,792—1,793,	475	W. 10° 30′ S.	523.12	
1,793—1,794,	251	S. 62° 15′ W.	500.81	
1,794—1,795,	373	S. 44° 15′ W.	469.07	Sta. 1,795—Bridge over Codorus creek.
1,795—1,796,	417	W. 4° 30′ S.	470.90	
1,796—1,797,	373	W. 7° 15′ S.	480.67	
1,797—1,798,	300	W. 21° 45′ S.	492.46	
1,798—1,799,	328	S. 42° 30′ W.	519.82	
1,799—1,900,	449	W. 22° 00 S.	556.59	
1,900—1,901,	470	W. 21° 00′ S.	572.19	
1,901—1,902,	403	W. 22° 30′ S.	568.44	
1,902—1,903,	420	W. 22° 45′ S.	553.91	
1,903—1,904,	394	W. 21° 15′ S.	547.37	
1,904—1,905,	315	W. 23° 30′ S.	524.94	
1,905—1,906,	383	W. 9° 00′ S.	557.65	
1,906—1,907,	435	W. 6° 30′ S.	580.13	
1,907—1,908,	525	W. 7° 45′ S.	609.43	
1,908—1,909,	418	W. 4° 30′ N.	639.82	
1,909—1,910,	370	W. 3° 00′ N.	642.52	
1,910—1,911,	401	W. 5° 15′ N.	626.88	
1,911—1,912,	287	W. 2° 15′ N.	623.46	
1,912—1,913,	228	W. 6° 15′ N.	602.67	
1,913—1,914,	391	S. 50° 00′ W.	545.11	
1,914—1,915,	329	S. 50° 45′ W.	505.00	
1,915—1,916,	543	W. 12° 00′ S.	524.28	
1,916—1,917,	271	W, 10° 00′ S.	513.71	
1,917—1,918,	422	S. 69° 15′ W.	488.18	Sta. 1,918—About opposite Geo. Dupps.
1,918—1,919,	312	S. 42° 30′ W.	485.47	
1,919—1,920,	370	S. 41° 15′ W.	490.95	
1,920—1,921,	260	S. 31° 45′ W.	490.20	
1,921—1,922,	209	S. 9° 00′ W.	490.49	
1,922—1,923,	410	S. 7° 30′ E.	489.79	
1,923—1,924,	100	S. 27° 30′ E.	494.76	
1,924—1,925,	450	S. 33° 45′ E.	502.37	Sta. 1,925—Opp. brickyard.
1,925—1,926,	415	S. 35° 30′ E.	521.21	
1,926—1,927,	379	S. 41° 15′ E.	532.77	
1,927—1,928,	456	S. 41° 15′ E.	534.78	
1,928—1,929,	371	S. 25° 00′ E.	530.88	
1,929—1,930,	306	S. 31° 00′ E.	533.21	
1,930—1,931,	325	S. 33° 00′ E.	528.11	
1,931—1,932,	480	S. 48° 15′ E.	521.15	Sta. 1,932—Road to left.
1,932—1,933,	391	S. 30° 30′ E.	525.80	Sta. 1,933—Store.
1,933—1,934,	411	S. 40° 00′ E.	524.61	Sta. 1,934—Road to right.
1,934—1,935,	332	S. 56° 45′ W.	512.26	

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station.......	Dist. in feet...	Bearing.......	Elevat'n above high tide at Phila*.......	Remarks.
1,935 to 1,936,	387	S. 53° 00′ W.	509.13	
1,936—1,937,	550	S. 60° 30′ W.	576.18	Sta. 1,937—Fork of road.
1,937—1,938,	191	S. 60° 00′ W.	582.85	
1,938—1,939,	241	S. 62° 30′ W.	575.50	
1,939—1,940,	373	S. 11° 15′ W.	588.07	Sta. 1,940—Road to right.
1,940—1,941,	400	S. 12° 00′ W.	598.43	
1,941—1,942,	399	S. 8° 15′ E.	619.18	
1,942—1,943,	369	S. 14° 30′ E.	623.46	
1,943—1,944,	340	S. 16° 00′ E.	650.15	
1,944—1,945,	344	S. 33° 30′ E.	658.54	
1,945—1,946,	335	S. 29° 45′ E.	669.93	
1,946—1,947,	393	S. 41° 45′ E.	647.10	
1,947—1,948,	436	S. 28° 30′ E.	664.21	
1,948—1,949,	368	S. 5° 15′ W.	676.43	
1,949—1,950,	401	S. 7° 15′ W.	702.66	
1,950—1,951,	398	S. 8° 00′ W.	719.34	
1,951—1,952,	414	S. 00° 30′ W.	733.79	
1,952—1,953,	418	S. 5° 00′ W.	744.49	Sta. 1,953—Cross-roads.
1,953—1,954,	315	S. 6° 30′ E.	762.35	
1,954—1,955,	470	S. 3° 45′ W.	779.41	
1,955—1,956,	210	S. 3° 45′ E.	780.63	
1,956—1,957,	415	S. 5° 30′ E.	752.91	
1,957—1,958,	300	S. 4° 30′ E.	770.79	
1,958—1,959,	340	S. 4° 00′ E.	795.41	
1,959—1,960,	520	S. 1° 00′ E.	781.79	
1,960—1,961,	321	S. 21° 00′ E.	758.45	
1,961—1,962,	405	S. 23° 00′ E.	753.75	
1,962—1,963,	367	S. 21° 45′ E.	774.01	
1,963—1,964,	390	S. 25° 00′ E.	792.96	
1,964—1,965,	450	S. 23° 30′ E.	820.41	
1,965—1,966,	412	S. 24° 45′ E.	806.86	
1,966—1,967,	279	S. 20° 30′ E.	798.66	
1,967—1,968,	400	S. 36° 00′ W.	809.58	
1,968—1,969,	424	S. 38° 15′ W.	831.76	Sta. 1,969—Cross-roads, Hanover and Baltimore road.
1,969—1,970,	289	S. 44° 00′ W.	846.04	
1,970—1,971,	230	W. 29° 00′ S.	837.35	
1,971—1,972,	242	S. 11° 45′ W.	822.37	Sta. 1,972—Hoffacker ore b'k.
1,971—1,973,	400	W. 10° 00′ S.	792.43	
1,973—1,974,	350	W. 12° 00′ S.	768.00	
1,974—1,975,	375	W. 29° 00′ S.	761.02	
1,975—1,976,	600	W. 30° 30′ S.	777.58	
1,976—1,977,	365	S. 59° 30′ W.	763.78	
1,977—1,978,	396	S. 61° 00′ W.	765.17	
1,978—1,979,	373	S. 48° 30′ W.	790.87	Sta. 1,979—Road to left.
1,979—1,980,	448	S. 47° 45′ W.	805.83	
1,980—1,981,	572	S. 59° 30′ W.	778.37	
1,981—1,982,	581	S. 59° 30′ W.	766.69	
1,982—1,983,	270	W. 2° 15′ N.	779.57	
1,983—1,984,	217	W. 5° 45′ S.	779.57	Sta. 1,984—E. Baumgardener
1,924—1,985,	460	W. 26° 30′ S.	491.40	
1,985—1,986,	164	W. 17° 45′ S.	501.40	
1,986—1,987,	380	N. 13° 30′ W.	508.81	
1,987—1,988,	305	N. 22° 00′ W.	529.03	
1,988—1,989,	423	W. 5° 15′ S.	545.65	Sta. 1,989—Wm. Dubs' lane to right.
1,989—1,990.	360	W. 19° 00′ S.	542.52	
1,990—1,991,	420	W. 26° 30′ S.	537.27	

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet...	Bearing.	Elevat'n above high tide at Phila*......	Remarks.
1,991 to 1,992,	462	S. 64° 00′ W.	537.27	
1,992—1,993,	301	S. 63° 15′ W.	527.22	
1,993—1,994,	427	S. 62° 45′ W.	524.10	
1,994—1,995,	246	W. 23° 30′ S.	533.77	
1,995—1,996,	210	S. 64° 00′ W.	536.21	Sta. 1,996—Cross-roads.
1,996—1,997,	420	W. 23° 45′ S.	522.06	
1,997—1,998,	420	W. 27° 30′ S.	509.25	
1,998—1,999,	399	W. 24° 00′ S.	501.35	
1,999—2,100,	429	W. 20° 30′ N.	515.08	Sta. 2,100—Bridge over stream
2,100—2,101,	355	W. 30° 15′ N.	534.29	
2,101—2,102,	513	N. 44° 00′ W.	572.15	
2,102—2,103,	420	W. 19° 00′ N.	617.64	
2,103—2,104,	223	W. 17° 00′ N.	607.27	
2,104—2,105,	495	W. 16° 00 N.	596.78	
2,105—2,106,	458	W. 20° 45′ N.	590.51	Sta. 2,106—Road to right.
2,106—2,107,	438	W. 10° 00′ N.	586.10	
2,107—2,108,	420	W. 6° 00′ N.	608.07	
2,108—2,109,	436	W. 16° 00′ N.	629.00	
2,109—2,110,	301	W. 17° 00′ N.	652.78	
2,110—2,111,	450	W. 21° 45′ N.	662.59	
2,111—2,112,	430	N. 48° 00′ W.	664.48	
2,112—2,113,	380	W. 15° 00′ N.	678.62	
2,113—2,114,	413	W. 12° 15′ N.	683.91	
2,114—2,115,	340	W. 10° 45′ N.	701.69	
2,115—2,116,	381	W. 13° 45′ N.	718.76	Sta. 2,116—Stambaugh.
2,116—2,117,	289	W. 13° 30′ N.	720.52	
2,117—2,118,	368	W. 11° 00′ N.	699.65	
2,118—2,119,	535	W. 12° 00′ N.	725.65	
2,119—2,120,	490	W. 13° 00′ N.	749.86	
2,120—2,121,	410	W. 12° 30′ N.	733.54	
2,121—2,122,	485	W. 13° 30′ N.	720.01	
2,122—2,123,	460	N. 48° 00′ W.	717.34	
2,123—2,124,	409	N. 49° 30′ W.	689.04	
2,124—2,125,	395	N. 50° 00′ W.	673.08	
2,125—2,126,	428	N. 50° 00′ W.	654.16	
2,126—2,127,	452	N. 48° 15′ W.	644.71	
2,127—2,128,	467	N. 51° 00′ W.	622.99	
2,128—2,129,	428	N. 51° 00′ W.	594.14	
2,129—2,130,	552	N. 53° 15′ W.	565.27	Sta. 2,130—Fork of road.
2,130—2,131,	365	W. 5° 30′ S.	559.76	
2,131—2,132,	310	W. 8° 45′ S.	556.88	Sta. 2,132—Cross-roads.
2,132—2,133,	295	W. 7° 30′ S.	554.40	
2,133—2,134,	415	W. 6° 30′ S.	550.17	
2,134—2,135,	468	W. 7° 15′ S.	559.81	Sta. 2,135—Bridge over race.
2,135—2,136,	462	W. 9° 00′ S.	569.33	
2,136—2,137,	540	W. 12° 15′ S.	587.37	Sta. 2,137—Road to right.
2,137—2,138,	230	W. 10° 45′ S.	587.51	Sta. 2,138—Road to left.
2,138—2,139,	448	W. 11° 00′ S.	584.91	Sta. 2,139—Road to left.
2,139—2,140,	423	W. 7° 30′ S.	586.77	
2,140—2,141,	505	W. 4° 00′ S.	606.62	
2,141—2,142,	294	W. 11° 45′ N.	611.74	
2,142—2,143,	394	W. 22° 15′ N.	605.20	Sta. 2,143—Hanover.
2,143—2,144,	350	W. 20° 45′ N.	602.64	Sta. 2,144—Cross-streets.
2,144—2,145,	397	W. 22° 30′ N.	598.59	Sta. 2,145—Hanover.
2,145—2,146,	452	W. 22° 00′ N.	594.12	Sta. 2,146—Hanover.
2,146—2,147,	321	W. 23° 45′ N.	591.33	Sta. 2,147—Cross-roads.

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet...	Bearing.......	Elevat'n above high tide at Phila.*......	Remarks.
2, 147 to 2, 148,	500	W. 22° 15′ N.	589.73	Sta. 2,148—Cross-roads.
2, 148—2, 149,	450	W. 23° 00′ N.	591.71	Sta. 2,149—Abbottstown st.
2, 149—2, 150,	290	S. 54° 15′ W.	590.87	Sta. 2,150—Fountain, Hanover.
2, 150—2, 151,	275	N. 40° 00′ W.	586.08	
2, 151—2, 152,	415	N. 35° 45′ W.	582.22	
2, 152—2, 153,	355	N. 36° 00′ W.	582.72	Sta. 2,153—Cross-streets.
2, 153—2, 154,	452	N. 37° 00′ W.	586.67	Sta. 2,154—H. L. & F. R. R.
2, 154—2, 155,	420	N. 36° 00′ W.	594.10	Sta. 2,155—Gettysburg R. R.
2, 155—2, 156,	375	N. 27° 45′ W.	604.15	
2, 156—2, 157,	330	N. 21° 30′ W.	619.59	
2, 157—2, 158,	455	N. 13° 45′ W.	611.40	
2, 158—2, 159,	268	N. 15° 30′ W.	601.43	
2, 159—2, 160,	425	N. 12° 30′ W.	592.76	
2, 160—2, 161,	430	N. 16° 15′ W.	578.27	
2, 161—2, 162,	415	N. 15° 00′ W.	571.05	
2, 162—2, 163,	430	N. 12° 45′ W.	576.94	
2, 163—2, 164,	378	N. 14° 00′ W.	591.80	Sta. 2,164—Cross-roads.
2, 164—2, 165,	405	N. 20° 15′ W.	582.04	
2, 165—2, 166,	344	N. 22° 30′ W.	577.53	
2, 166—2, 167,	442	N. 20° 15′ W.	573.68	
2, 167—2, 168,	572	N. 21° 30′ W.	577.00	
2, 168—2, 169,	420	N. 18° 15′ W.	559.06	
2, 169—2, 170,	440	N. 21° 30′ W.	547.53	
2, 170—2, 171,	442	N. 21° 30′ W.	538.65	
2, 171—2, 172,	421	N. 20° 15′ W.	537.43	
2, 172—2, 173,	370	N. 20° 00′ W.	532.25	
2, 173—2, 174,	366	N. 19° 30′ W.	529.69	
2, 174—2, 175,	301	N. 22° 15′ W.	523.64	
2, 175—2, 176,	400	N. 17° 45′ W.	522.36	
2, 176—2, 177,	382	N. 8° 45′ W.	530.69	
2, 177—2, 178,	475	N. 19° 15′ W.	549.22	
2, 178—*2, 186*,	357	N. 20° 30′ W.	531.58	Sta. 2,186—County line
2, 186—2, 187,	280	N. 20° 30′ W.	525.56	
2, 187—2, 188,	382	N. 14° 15′ W.	520.56	
2, 188—2, 189,	419	N. 18° 45′ W.	520.31	
2, 189—2, 190,	383	N. 20° 15′ W.	523.22	
2, 190—2, 191,	310	N. 16° 30′ W.	530.88	
2, 191—2, 192,	420	N. 17° 30′ W.	550.54	
2, 192—2, 193,	320	N. 17° 30′ W.	564.40	
2, 193—2, 194,	242	N. 23° 00′ W.	554.89	Sta. 2,194—Road to Oxford.
2, 194—2, 195,	398	N. 23° 15′ W.	536.50	
2, 195—2, 196,	419	N. 22° 15′ W.	533.57	
2, 196—2, 197,	401	N. 22° 00′ W.	534.73	
2, 197—2, 198,	241	N. 22° 00′ W.	533.40	
2, 198—2, 199,	272	N. 20° 30 W.	525.97	Sta. 2,199—Cross-roads.
2, 199—2, 300,	301	E. 30° 45′ N.	530.00	Sta. 2,300—Small lime quarries.
2, 300—2, 301,	227	E. 33° 45′ N.	532.25	
2, 301—2, 302,	313	E. 29° 00′ N.	545.22	
2, 302—2, 303,	318	E. 32° 00 N.	557.43	
2, 303—2, 304,	395	N. 24° 00′ E.	553.08	
2, 304—2, 305,	625	N. 27° 45′ E.	577.64	Sta. 2,305—Ore diggings on Slagle's farm.
2, 199—2, 306,	371	N. 21° 30′ W.	527.60	
2, 306—2, 307,	370	N. 21° 30′ W.	531.78	
2, 307—2, 308,	130	N. 9° 15′ E.	533.52	Sta. 2,308—Bittinger's L. S. quarry.

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet...	Bearing........	Elevat'n above high tide at Phila.*......	Remarks.
2, 307 to 2, 309,	247	S. 56° 30′ W.	523.46	[quarry.
2, 309—2, 310,	160	S. 47° 00′ W.	522.95	Sta. 2,310—Bittinger's L. S.
2, 310—2, 311,	570	S. 38° 30′ W.	518.62	Sta. 2,311—J. W. Hendricks'
2, 150—2, 312,	535	S. 35° 00′ E.	584.82	Sta. 2,312—Wat'r st. [quarries
2, 312—2, 313,	473	S. 35° 15′ E.	583.59	Sta. 2,313—Hanover cross st.
2, 313—2, 314,	547	S. 37° 30′ E.	591.08	Sta. 2,314—Street to right.
2, 314—2, 315,	440	S. 36° 45′ E.	600.94	
2, 315—2, 316,	145	S. 36° 45′ E.	601.78	Sta. 2,316—Street to left.
2, 316—2, 317,	425	S. 34° 45′ E.	597.70	Sta. 2,317—Street to right.
2, 317—2, 318,	357	S. 37° 15′ E.	593.67	
2, 318—2, 319,	338	S. 34° 45′ E.	592.18	
2, 319—2, 320,	326	S. 38° 30′ E.	592.64	
2, 320—2, 321,	343	S. 35° 30′ E.	597.34	
2, 321—2, 322,	442	S. 38° 30′ E.	605.69	
2, 322—2, 323,	423	S. 35° 45′ E.	622.43	
2, 323—2, 324,	340	S. 31° 00′ E.	635.59	Sta. 2,324—Road to left.
2, 324—2, 325,	495	E. 15° 00′ N.	623.07	
2, 325—2, 326,	435	E. 12° 30′ N.	615.37	
2, 326—2, 327,	535	E. 12° 45′ N.	605.58	Sta. 2,327—Bauman's opening,
2, 324—2, 328,	332	W. 28° 45′ S.	645.72	Flickinger's ore bank.
2, 328—2, 329,	380	W. 33° 00′ S.	655.68	
2, 329—2, 330,	345	W. 26° 30′ S.	653.58	Sta. 2,330—Delone's ore b'k.
2, 330—2, 331,	487	W. 24° 00′ S.	640.43	
2, 331—2, 332,	258	W. 23° 45′ S.	647.11	Sta. 2,332—Forney's ore b'k.
2, 150—2, 333,	120	W. 27° 15′ S.	588.78	[streets.
2, 333—2, 334,	423	W. 37° 30′ S.	586.92	Sta. 2,334—Hanover, cross-
2, 334—2, 335,	475	W. 37° 15′ S.	580.70	Sta. 2,335—Street to right.
2, 335—2, 336,	580	W. 34° 00′ S.	569.91	
2, 336—2, 337,	472	S. 29° 45′ W.	557.97	Sta. 2,337—Tannery.
2, 337—2, 338,	305	S. 34° 15′ W.	557.36	
2, 338—2, 339,	424	S. 42° 00′ W.	556.13	
2, 339—2, 340,	521	S. 44° 45′ W.	553.84	
2, 340—2, 341,	507	S. 44° 00′ W.	552.98	Sta. 2,341—Road to left.
2, 341—2, 342,	412	S. 47° 00′ W.	549.97	
2, 342—2, 344,	430	S. 62° 30′ W.	548.08	
2, 344—2, 345,	372	S. 64° 00′ W.	545.36	Sta. 2,345—Road to right,
2, 345—2, 346,	308	S. 64° 45′ W.	544.47	Mudtown.
2, 346—2, 347,	443	W. 26° 45′ S.	540.88	
2, 347—2, 348,	338	S. 44° 30′ W.	542.27	Sta. 2,348—Cross-roads.
2, 348—2, 349,	480	S. 39° 00′ W.	569.09	
2, 349—2, 350,	430	S. 37° 30′ W.	566.98	
2, 350—2, 351,	413	S. 37° 45′ W.	566.15	
2, 351—2, 352,	429	S. 38° 30′ W.	569.88	
2, 352—2, 353,	310	S. 37° 00′ W.	579.18	
2, 353—2, 354,	580	S. 28° 00′ W.	604 99	
2, 354—2, 355,	590	S. 17° 15′ W.	601 04	
2, 355—2, 356,	435	S. 43° 30′ W.	607.22	[school house.
2, 356—2, 357,	507	S. 44° 00′ W.	605.90	Sta. 2,357—Cross-roads and
2, 357—2, 358,	380	S. 47° 00′ W.	607.57	Sta. 2,358—Schwartz's ore
2, 358—2, 359,	328	S. 44° 45′ W.	604.52	bank.
2, 359—2, 360,	405	S. 45° 30′ W.	591.80	
2, 360—2, 361,	331	S. 44° 00′ W.	587.56	Sta. 2,361—Schwartz's (Sam.)
2, 361—2, 362,	436	S. 44° 45′ W.	578.19	bank, No. 2.
2, 362—2, 363,	430	S. 48° 30′ W.	575.95	

* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet...	Bearing........	Elevat'n above high tide at Phila.*......	Remarks.
2,363 to 2,364,	340	W. 24° 00′ S.	585.74	
2,364—2,365,	373	W. 27° 00′ S.	615.10	Sta 2,365—Schwartz's (Sol.) bank.
2,365—2,366,	439	S. 57° 00′ W.	600.79	
2,366—2,367,	355	S. 54° 45′ W.	601.29	
2,367—2,368,	379	S. 54° 00′ W.	613.95	
2,368—2,369,	270	S. 56° 30′ W.	620.70	
2,369—2,370,	415	S. 54° 30′ W.	615.26	
2,370—2,371,	397	S. 56° 30′ W.	601.40	Sta. 2,371—Slate quarry, Sol. Schwartz's.
2,371—2,372,	360	S. 53° 30′ W.	586.53	
2,372—2,373,	188	S. 52° 45′ W.	582.38	
2,373—2,374,	410	W. 15° 30′ S.	572.83	
2,374—2,375,	305	W. 12° 45′ S.	570.18	
2,375—2,376,	465	W. 15° 45′ S.	566.55	Sta. 2,376—Bridge over mill race.
2,376—2,377,	360	S. 52° 30′ W.	551.90	
2,377—2,378,	400	S. 46° 45′ W.	555.38	
2,378—2,379,	328	S. 49° 30′ W.	552.99	
2,379—2,380,	390	S. 11° 30′ W.	557.63	
2,380—2,381,	565	W. 11° 30′ S.	559.27	
2,381—2,382,	750	W. 11° 00′ S.	587.85	Sta. 2,382—Boyer's (David) bank.
2,382—2,383,	305	S. 2° 00′ W.	590.96	Sta. 2,383—Boyer's shallow diggings.
2,380—2,384,	342	S. 11° 30′ W.	565.39	
2,384—2,385,	420	S. 6° 30′ E.	570.26	Sta. 2,385—Boyer's lane.
2,385—2,386,	263	S. 00° 30′ E.	578.83	
2,386—2,387,	440	S. 47° 45′ W.	609.54	
2,387—2,388,	450	S. 55° 30′ W.	624.21	
2,388—2,389,	175	S. 56° 30′ W.	615.76	Sta. 2,389—Road to right.
2,389—2,390,	370	S. 25° 00′ W.	601.22	Sta. 2,390—Road to left.
2,390—2,391,	519	S. 52° 00′ W.	637.71	
2,391—2,392,	213	S. 45° 30′ W.	638.58	
2,392—*1,841*,	420	S. 51° 15′ W.	635.89	
1,841—1,842,	377	S. 60° 30′ W.	621.07	Sta. 1,842—Fork of road.
1,842—1,843,	440	S. 41° 15′ E.	645.14	
1,843—1,844,	490	S. 37° 45′ E.	661.11	
1,844—1,845,	250	S. 46° 00′ E.	674.56	
1,845—1,846,	413	S. 41° 00′ E.	682.37	
1,846—1,847,	390	S. 35° 30′ E.	683.50	
1,847—1,848,	595	S. 37° 00′ E.	678.50	
1,848—1,849,	430	E. 24° 30′ S.	682.76	
1,849—1,850,	585	E. 20° 00′ S.	700.78	
1,850—1,851,	267	E. 20° 30′ S.	707.78	
.....—1,852,	....	....	684.97	Sta. 1,852—Lefever's ore openings.
1,852—1,853,	400	S. 29° 45′ W.	674.05	
1,853—1,854,	224	S. 54° 30′ W.	674.63	
1,854—1,855,	257	W. 20° 45′ S.	676.12	
1,855—1,856,	230	S. 48° 00′ W.	681.13	
1,856—1,857,	373	S. 52° 00′ W.	689.49	
1,857—1,858,	146	W. 19° 00′ S.	693.10	
1,858—1,859,	360	W. 15° 30′ N.	697.82	
1,859—1,860,	380	N. 61° 00′ W.	707.78	
1,842—1,861,	438	W. 15° 15′ S.	612.53	
1,861—1,862,	445	W. 15° 00′ S.	604.12	Sta. 1,862—Road to left.
1,862—1,863,	400	W. 10° 00′ S.	582.24	
1,863—1,864,	485	W. 9° 45′ S.	571.67	Sta. 1,864—Road to left.
1,864—1,865,	284	W. 1° 30′ S.	575.56	

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* To reduce to mean ocean level 6.913 must be added.

STATEMENT—Continued.

Station.......	Dist. in feet...	Bearing.......	Elevat'n above high tide at Phila.*.......	Remarks.
1,865 to 1,866.	318	W. 5° 00′ S.	594.04	
1,866—1,867,	420	S. 7° 30′ W.	592.11	
1,867—1,868,	390	N. 41° 45′ W.	615.90	Sta. 1,867—Early, Killinger & Co.'s banks.
1,868—1,869,	430	W. 26° 00′ S.	618.65	
1,869—1,870,	450	W. 14° 30′ N.	627.16	
1,870—1,871,	384	W. 17° 30′ S.	623.82	
1,871—1,872,	364	W. 12° 00′ S.	622.87	
1,872—1,873,	440	W. 13° 30′ S.	614.16	
1,873—1,874,	430	S. 2° 00′ E.	640.39	
1,874—1,875,	380	S. 5° 30′ E.	641.68	Sta. 1,875—Lefever's ore b'k.
1,873—1,876,	590	W. 5° 15′ N.	607.79	Sta. 1,876—Road to left.
1,876—1,877,	351	W. 20° 30′ N.	603.72	
1,877—1,878,	224	W. 19° 45′ N.	604.64	
1,878—*1,896*,	274	W. 19° 00′ N.	605.53	Sta. 1,896—Road to right.
1,896—1,897,	500	W. 9° 15′ N.	604.38	Sta. 1,897—Hanover, Littlestown, Frederick railroad.
1,897—1,898,	195	S. 51° 15′ W.	604.38	
1,898—1,899,	412	S. 3° 00′ W.	606.40	
1,899—2,000,	300	S. 37° 00 W.	622.27	Sta. 2,000—Limestone quarries.
2,000—2,001,	450	S. 4° 15′ W.	634.82	
2,001—2,002,	615	S. 6° 30′ W.	634.82	
2,002—2,003,	185	S. 2° 00′ E.	632.14	Sta. 2,003—Widow Clark's [bank.
2,003—2,003′,	700	S. 5° 30′ E.	650.48	Sta. 2,003′—Widow Clark's bank.
1,897—2,004,	542	W. 6° 00′ N.	610.34	
2,004—2,005,	434	W. 7° 45′ N.	618.54	
2,005—2,006,	240	W. 6° 30′ N.	622.38	
2,006—2,007,	330	W. 00° 45′ S.	617.69	Sta. 2,007—Road to right.
2,007—2,008,	440	W. 26° 00′ S.	615.27	
2,008—2,009,	445	W. 25° 30 S.	614.74	
2,009—2,010,	360	W. 25° 15′ S.	614.13	Sta. 2,010—Bonnaughtown road.
2,010—2,011,	470	W. 23° 15′ S.	616.06	
2,011—2,012,	440	W. 25° 00′ S.	619.49	
2,012—2,013,	374	W. 24° 00′ S.	628.20	
2,013—2,014,	432	W. 17° 45′ S.	626.21	Sta. 2,014—Opposite Spangler's (Chas.)
2,014—2,015,	576	W. 18° 45′ S.	623.85	
2,015—2,016,	312	W. 18° 30′ S.	621.14	
2,016—2,017,	550	W. 21° 45′ S.	624.33	
2,017—2,018,	381	W. 27° 15′ S.	628.33	
2,018—2,019,	525	W. 26° 00′ S.	625.28	
2,019—2,020,	283	W. 27° 00′ S.	618.46	Sta. 2,020—Cross-roads.
2,020—2,021,	373	W. 25° 45 S.	611.97	
2,021—2,022,	380	W. 27° 15′ S.	618.16	
2,022—2,023,	240	W. 24° 30′ S.	624.45	Sta. 2,023—Cross-streets. } Littlestown.
2,023—2,024,	407	W. 27° 00′ S.	616.39	Sta. 2,024—Cross-streets.
2,024—2,025,	307	W. 26° 00′ S.	624.43	Sta. 2,025—Cross-streets.
2,324—*1,879*,	390	S. 42° 15′ E.	627.87	
1,879—1,880,	342	S. 36° 00′ E.	636.01	
1,880—1,881,	367	S. 35° 45′ E.	660.34	
1,881—1,882,	520	S. 35° 30′ E.	676.36	
1,882—1,883,	397	S. 36° 15′ E.	677.27	
1,883—1,884,	450	S. 36° 30′ E.	686.32	
1,884—1,885,	435	S. 33° 00′ E.	706.16	
1,885—1,886,	475	S. 25° 15′ E.	726.21	
1,886—1,887,	340	S. 24° 45′ E.	735.90	
1,887—1,888,	585	S. 24° 00′ E.	745.96	

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* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station.	Dist. in feet.	Bearing.	Elevat'n above high tide at Phila.*	Remarks.
1,888 to 1,889,	480	S. 25° 00′ E.	740.78	
1,889—1,890,	338	S. 21° 00′ E.	748.15	
1,890—1,891,	305	S. 10° 00′ E.	743.73	
1,891—1,892,	346	S. 10° 00′ E.	747.74	Sta. 1,892—Road to left.
1,892—1,893,	230	S. 8° 45′ E.	756.43	Sta. 1,893—Road to right.
1,893—1,894,	255	S. 6° 15′ E.	759.39	
1,894—1,895,	205	S. 4° 45′ W.	752.54	
2,025—2,026,	305	W. 26° 45′ S.	622.54	Sta. 2,026—Cross-streets, Littlestown.
2,026—2,027,	280	W. 26° 00′ S.	624.36	Sta. 2,027—Cross-streets, Littlestown.
2,027—2,028,	405	W. 26° 00′ S.	636.87	
2,028—2,029,	234	W. 27° 15′ S.	635.63	
2,029—2,030,	615	W. 2° 30′ S.	639.91	
2,030—2,031,	412	W. 4° 15′ N.	624.73	
2,031—2,032,	540	W. 7° 00′ N.	626.90	
2,032—2,033,	448	W. 7° 30′ N.	633.99	
2,033—2,034,	500	W. 4° 45′ N.	631.58	
2,034—2,035,	330	W. 7° 30′ S.	631.82	Sta. 2,035—Gettysburg pike.
2,035—2,036,	298	W. 13° 00′ S.	640.10	
2,036—2,037,	480	W. 28° 00′ S.	623.43	
2,037—2,038,	425	S. 26° 45′ W.	612.07	
2,038—2,039,	450	S. 24° 00′ W.	610.68	Sta. 2,039—Road to right.
2,039—2,040,	520	S. 41° 45′ W.	606.83	
2,040—2,041,	363	S. 44° 00′ W.	603.86	
2,041—2,042,	450	S. 44° 30′ W.	601.67	
2,042—2,043,	305	S. 44° 00′ W.	602.60	
2,043—2,044,	434	S. 43° 45′ W.	606.82	
2,044—2,045,	444	S. 43° 30′ W.	604.66	
2,045—2,046,	420	S. 51° 00′ W.	616.04	Sta. 2,046—School house.
2,046—2,047,	318	S. 58° 30′ W.	606.57	
2,047—2,048,	247	S. 34° 00′ W.	613.61	
2,048—2,049,	408	S. 35° 00′ W.	615.41	
2,049—2,050,	459	S. 28° 15′ W.	607.01	
2,050—2,051,	481	S. 31° 15′ W.	581.57	Sta. 2,051—Road to right.
2,051—2,052,	660	S. 31° 30′ W.	560.25	
2,052—2,053,	700	S. 29° 30′ W.	551.08	Sta. 2,053—Cross-roads
2,053—2,054,	228	S. 37° 00′ W.	553.20	
2,054—2,055,	340	S. 32° 00′ W.	549.94	
2,055—2,056,	300	S. 25° 45′ W.	535.45	
2,056—2,057,	420	S. 14° 30′ W.	522.64	
2,057—2,058,	393	S. 22° 30′ W.	532.94	
2,058—2,059,	387	S. 48° 30′ W.	536.66	
2,059—2,060,	380	S. 45° 45 W.	551.37	Sta. 2,060—Maryland line.
2,047—2,061,	312	S. 60° 00′ E.	610.45	
2,061—2,062,	535	S. 51° 30′ E.	585.52	
2,062—2,063,	494	S. 17° 00′ E.	581.46	
2,063—2,064,	700	S. 15° 30′ E.	572.07	
2,064—2,065,	560	S. 58° 00′ E.	572.81	
2,065—2,066,	770	S. 60° 30′ E.	596.78	
2,066—2,067,	442	S. 57° 00′ E.	550.73	Sta. 2,067—Bend in road.
2,067—2,068,	595	S. 21° 15′ W.	522.31	
2,068—2,069,	393	S. 31° 00′ E.	518.80	
2,069—2,070,	110	S. 37° 00′ E.	523.42	
2,070—2,071,	152	S. 21° 45′ E,	540.67	
2,071—2,072,	190	S. 57° 45′ E.	548.69	

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* To reduce to mean ocean level 6.913 must be added.

STATEMENT—Continued.

Station.	Dist. in feet.	Bearing.	Elevat'n above high tide at Phila.*	Remarks.
2,072 to 2,073,	345	S. 41° 00' E.	546.79	
2,073—2,074,	700	S. 23° 00' E.	568.77	Sta. 2,074—Maryland line.
2,070—2,075,	380	E. 3° 00' N.	523.55	
2,075—2,076,	365	E. 3° 30' S.	527.35	
2,076—2,077,	620	E. 0° 45' N.	559.57	
2,077—2,078,	530	E. 8° 30' N.	584.80	
2,078—2,079,	302	E. 2° 00' S.	599.33	
2,079—2,080,	570	E. 11° 30' S.	515.36	
2,080—2,081,	353	E. 18° 00' S.	518.95	
2,081—2,082,	560	E. 15° 30' S.	623.95	
2,082—2,083,	410	E. 7° 30' S.	641.99	
2,083—2,084,	365	E. 13° 15 S.	651.55	
2,084—2,085,	360	E. 23° 45' N.	646.52	
2,085—2,086,	283	E. 25° 15 N.	640.24	
2,086—2,087,	382	E. 22° 45' N.	636.25	
2,087—2,088,	547	E. 16° 15' S.	637.12	
2,088—2,089,	570	E. 17° 00' S.	649.34	
2,089—2,090,	370	E. 17° 00' S.	660.42	
2,090—2,091,	101	E. 27° 15' S.	659.77	
2,091—2,092,	217	E. 7° 45' S.	664.98	
2,092—2,093,	175	E. 25° 30' S.	669.36	
2,093—2,094,	422	E. 13° 30' S.	681.43	
2,094—2,095,	290	E. 9° 30' S.	679.94	
2,095—2,096,	462	E. 3° 45' S.	676.76	
2,096—2,097,	700	E. 2° 45' S.	651.91	
2,097—2,098,	500	E. 4° 00 S.	620.95	Sta. 2,098—Baltimore pike.
2,098—2,099,	585	E. 3° 00' S.	617.35	
2,099—2,200,	540	S. 8° 30' E.	599.15	
2,200—2,201,	512	S. 6° 00' E.	585.43	Sta. 2,201—Maryland line.
2,200—2,202,	445	E. 10° 30' S.	615.70	
2,202—2,203,	265	E. 22° 30' N.	633.64	
2,203—2,204,	360	E. 9° 30' S.	652.47	
2,204—2,205,	510	E. 12° 45' S.	637.93	Sta. 2,205—Mill-dam.
2,205—2,206,	495	E. 12° 00' S.	641.79	
2,206—2,207,	300	E. 12° 15' S.	642.57	Sta. 2,207—Bend in road.
2,207—2,208,	323	S. 6° 30' E.	676.81	Sta. 2,208—Bend in road.
2,208—2,209,	308	E. 5° 30' S.	682.63	
2,209—2,210,	515	E. 2° 30' S.	696.84	
2,210—2,211,	512	E. 3° 30' S.	712.61	
2,211—2,212,	312	E. 3° 30' S.	718.41	
2,212—2,213,	640	E. 3° 00' S.	742.60	
2,213—2,214,	522	E. 2° 45' S.	730.18	
2,214—2,215,	455	E. 2° 00' S.	728.18	Sta. 2,215—Bend in road.
2,215—2,216,	246	N. 6° 00' E.	737.85	
2,216—2,217,	445	N. 5° 45' E.	739.14	Sta. 2,217—Bend in road.
2,217—2,218,	330	E. 1° 45' N.	749.21	
2,218—2,219,	330	E. 1° 15' N.	750.07	
2,219—2,220,	350	E. 3° 00' N.	739.88	
2,220—2,221,	400	E. 2° 00' N.	741.16	
2,221—2,222,	535	E. 2° 30' N.	755.61	
2,222—2,223,	460	E. 2° 15' N.	752.94	
2,223—2,224,	208	E. 45° 00' S.	742.83	
2,224—2,225,	420	E. 20° 15' S.	762.11	
2,225—2,226,	700	E. 4° 30' S.	764.98	

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*To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet...	Bearing.......	Elevat'n above high tide at Phila.[*]	Remarks.
2, 226 to 2, 227,	397	E. 4° 00′ S.	766.37	Sta. 2,226—Cross-roads.
2, 227—2, 228,	700	E. 7° 00′ S.	778.97	
2, 228—2, 229,	340	E. 27° 30′ S.	776.32	
2, 229—2, 230,	175	E. 5° 30′ S.	772.24	
2, 230—2, 231,	255	E. 16° 00′ N.	776.17	
2, 231—2, 232,	414	N. 45° 00′ E.	766.29	
2, 232—2, 233,	525	N. 39° 15′ E.	751.96	
2, 233—2, 234,	770	N. 2° 30′ W.	750.88	Sta. 2,234—Bair's opening.
2, 099—2, 235,	420	N. 0° 45′ W.	648.88	
2, 235—2, 236,	610	N. 6° 00′ W.	696.01	
2, 236—2, 237,	290	N. 19° 00′ W.	709.72	
2, 237—2, 238,	505	N. 36° 00′ W.	688.35	
2, 238—2, 239,	530	N. 33° 15′ W.	667.30	
2, 239—2, 240,	540	N. 33° 45′ W.	661.26	
2, 240—2, 241,	365	N. 33° 30′ W.	641.41	
2, 241—2, 242,	570	N. 33° 00′ W.	637.88	
2, 242—2, 243,	120	N. 33° 00′ W.	641.50	
2, 243—2, 244,	645	N. 32° 30′ W.	667.54	
2, 244—2. 245,	490	N. 33° 30′ W.	658.80	
2, 245—2, 246,	590	N. 33° 00′ W.	653.10	
2, 246—2, 247,	465	N. 33° 15′ W.	626.51	
2, 247—2, 248,	388	N. 41° 00′ W.	595.30	
2, 248—2, 249,	550	N. 40° 15′ W.	573.97	
2, 249—2, 250,	695	N. 41° 15′ W.	586.90	
2, 250—2, 251,	500	N. 40° 45′ W.	598.18	
2, 251—2, 252,	585	N. 40° 00′ W.	616.69	Sta. 2,252—Littlestown.
2, 252—2, 253,	425	N. 42° 00′ W.	619.58	Sta. 2,253—H. L. & F. R. R.
2, 253—2, 254,	475	N. 40° 30′ W.	629.30	Sta. 2,254—Cross-streets.
2, 254—2, 255,	285	N. 26° 00′ W.	624.43	Sta. 2,255—Cross-streets.
2, 025—2, 256,	310	N. 26° 45′ W.	607.04	Sta. 2,256—Cross-roads.
2, 256—2, 257,	530	N. 34° 00′ W.	595.80	
2, 257—2, 258,	460	N. 35° 15′ W.	591.80	Sta. 2,258—Road to right.
2, 258—2, 259,	510	N. 34° 15′ W.	581.40	
2, 259—2, 260,	319	N. 33° 30′ W.	583.00	
2, 260—2, 261,	537	N. 33° 45′ W.	594.55	
2, 261—2, 262,	272	N. 32° 30′ W.	595.75	
2, 262—2, 263,	520	N. 33° 15′ W.	579.11	
2, 263—2, 264,	490	N. 34° 30′ W.	594.06	
2, 264—2, 265,	220	N. 60° 45′ W.	605.26	
2, 265—2, 266,	580	W. 14° 45′ N.	588.38	
2, 266—2, 267,	475	W. 14° 30′ N.	561.45	
2, 267—2, 268,	450	W. 15° 00′ N.	555.28	
2, 268—2, 269,	512	W. 15° 00′ N.	576.73	
2, 269—2, 270,	140	W. 24° 00′ N.	586.82	Sta. 2,270—Lime kiln.
1, 895—2, 271,	456	S. 6° 30′ W.	744.61	
2, 271—2, 272,	465	S. 6° 30′ W.	738.94	
2, 272—2, 273,	450	S. 5° 30′ W.	740.25	
2, 273—2, 274,	437	S. 7° 45′ W.	751.04	
2, 274—2, 275,	600	S. 6° 45′ W.	766.04	
2, 275—2, 276,	460	South.	766.82	
2, 276—2, 277,	467	S. 2° 30′ E.	767.10	
2, 277—2, 278,	335	S. 1° 30′ E.	768.64	
2, 278—2, 279,	419	S. 7° 00′ E.	755.86	
2, 279—2, 280,	165	S. 11° 00′ E.	756.19	

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[*] To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet ..	Bearing.......	Elevat'n above high tide at Phila.*......	Remarks.
2,280 to 2,281,	345	S. 27° 00′ E.	761.71	
2,281—2,282,	500	S. 33° 45′ E.	789.31	
2,282—2,283,	340	S. 32° 30′ E.	784.38	
2,283—2,284,	506	S. 32° 30′ E.	772.59	
2,284—2,285,	490	S. 32° 00′ E.	774.75	
2,285—2,286,	492	S. 32° 00′ E.	761.17	
2,286—2,287,	415	S. 26° 00′ E.	758.26	
2,287—2,288,	400	S. 16° 00′ E.	772.78	
2,288—2,289,	448	S. 15° 30′ E.	757.82	Sta. 2,288—Road to left.
2,289—2,290,	530	S. 18° 15′ E.	753.21	
2,290—2,291,	410	S. 17° 15′ E.	771.09	
2,291—2,292,	402	S. 28° 30′ E.	779.85	
2,292—2,293,	440	S. 22° 30′ E.	810.91	
2,293—2,294,	400	S. 24° 00′ E.	832.43	
2,294—2,295,	280	S. 25° 00′ E.	851.30	
2,295—2,296,	410	S. 32° 30′ E.	824.36	
2,296—2,297,	470	S. 32° 00′ E.	829.81	
2,297—2,298,	243	S. 33° 00′ E.	842.03	
2,298—2,299,	426	S. 34° 30′ E.	824.44	
2,299—2,400,	410	S. 33° 30′ E.	828.50	
2,400—2,401,	560	S. 33° 00′ E.	848.83	
2,401—2,402,	430	S. 46° 30′ E.	833.82	
2,402—2,403,	471	S. 53° 00′ E.	813.14	
2,403—2,404,	460	S. 54° 30′ E.	819.81	
2,404—2,405,	278	S. 61° 30′ E.	834.77	
2,405—2,406,	450	S. 55° 00′ E.	858.31	Sta. 2,406—Cross-roads.
2,406—2,407,	750	S. 52° 30′ E.	860.04	
2,407—2,408,	720	E. 21° 00′ S.	824.04	
2,408—2,409,	390	E. 22° 00′ S.	808.71	
2,409—2,410.	535	E. 20° 30′ S.	782.28	
2,410—2,411,	510	S. 48° 00′ E.	771.16	
2,411—2,412,	560	S. 45° 00′ E.	798.04	
2,412—2,413,	800	S. 40° 00′ E.	814.52	
2,413—2,414,	605	S. 23° 00′ E.	847.61	
2,414—2,415,	700	S. 20° 00′ E.	857.76	
2,415—2,416,	619	S. 1° 00′ E.	875.77	
2,416—2,417,	565	S. 0° 30′ E.	869.67	
2,417—2,418,	491	S. 27° 30′ E.	891.08	
2,418—2,419,	548	S. 44° 00′ E.	936.45	
2,419—2,420,	218	S. 40° 30′ E.	950.14	
2,420—2,421,	500	S. 37° 00′ E.	935.29	Sta. 2,421—Road to left.
2,421—2,422,	515	S. 36° 00′ E.	943.07	
2,422—2,423,	435	S. 34° 00′ E.	969.61	
2,423—2,424,	187	S. 40° 30′ E.	968.36	Sta. 2,424—Maryland line.
2,307—2,425,	389	N. 22° 45′ W.	537.42	
2,425—2,426,	290	N. 22° 00′ W.	546.03	
2,426—2,427,	512	N. 23° 00′ W.	543.78	
2,427—2,428,	424	N. 22° 15′ W.	540.35	
2,428—2,429,	510	N. 23° 00′ W.	561.11	
2,429—2,430,	430	N. 21° 30 W.	545.37	
2,430—2,431,	520	N. 21° 00′ W.	546.57	
2,431—2,432,	362	N. 21° 30′ W.	651.20	
2,432—2,433,	455	N. 23° 00′ W.	665.49	
2,433—2,434,	380	N. 21° 30′ W.	672.56	

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* To reduce to mean ocean level 6.913 must be added.

STATEMENT—CONTINUED.

Station........	Dist. in feet...	Bearing........	Elevat'n above high tide at Phila.*.......	Remarks.
2,434 to 2,435,	660	N. 22° 00′ W.	667.74	
2,435—2,436,	550	N. 22° 00′ W.	660.37	Sta. 2,436—Opposite Myers' lime quarry.
2,436—2,437,	600	N. 22° 15′ W.	664.75	
2,437—2,438,	550	N. 22° 00′ W.	678.17	
2,438—2,439,	363	N. 20° 30′ W.	701.91	
2,439—2,440,	410	N. 21° 45′ W.	689.61	
2,440—2,441,	410	N. 31° 00′ W.	696.74	Sta. 2,441—C. Glass'.
2,*168*—2,442,	940	W. 20° 30′ S.	574.27	
2,442—2,443,	940	S. 2° 00′ E.	557.07	
2,443—2,444,	450	S. 4° 45′ W.	548.02	

In order to prevent the use of the same numbers for different stations where topographical work was being performed by Mr. Lehman and me at the same time in distant parts of the field, the plan was adopted of designating Mr. Lehman's note books by even numbers, and all stations in them by the current numbers of even hundreds. Thus the next station to 299 would be 400, &c. My own note books bore the odd numbers, and the stations in them were in the odd hundreds (199—300, &c.) When it was convenient, for any cause, to exchange note books, the series was made odd or even, depending upon the number of the book. The numbers remaining unused, towards the close of the season were employed indiscriminately by Mr. Lehman.

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* To reduce to mean ocean level 6.913 must be added.

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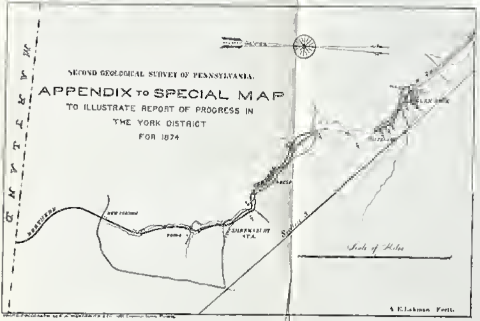

SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA.

APPENDIX TO SPECIAL MAP
TO ILLUSTRATE REPORT OF PROGRESS IN
THE YORK DISTRICT
FOR 1874

Traps of the Mesozoic sandstone, 115; Connecticut Valle

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